FEDERAL UNIVERSITY OF TECHNOLOGY
MINNA, NIGER STATE, NIGERIA

SCHOOL OF ENVIRONMENTAL TECHNOLOGY
INTERNATIONAL CONFERENCE (SETIC) 2018

CONFERENCE Proceedings

CONTEMPORARY ISSUES AND SUSTAINABLE PRACTICES IN THE BUILT ENVIRONMENT

EDITORS:
Asimiyu M. JUNAID
Olatunde F. ADEDAYO
Richard A. JIMOH
Luqman O. OYEWOBI

School of Environmental Technology International Conference (SETIC) 2018

10-12 APRIL 2018

Federal University of Technology Minna, Niger State, Nigeria

CONFERENCE PROCEEDINGS

Volume 2

Editors
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10th – 12th APRIL 2018
School of Environmental Technology,
Federal University of Technology, Minna, Niger State, Nigeria.

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FOREWORD

The organising committee of the 2nd School of Environmental Technology International Conference is pleased to welcome you to Federal University of Technology Minna, Niger State Nigeria.

The conference provides an international forum for researchers and professionals in the built and allied professions to address fundamental problems, challenges and prospects that affect the Built Environment as it relates to Contemporary Issues and Sustainable Practices in the Built Environment. The conference is a platform where recognised best practices, theories and concepts are shared and discussed amongst academics, practitioners and researchers. The scope and papers are quite broad but have been organised around the sub-themes listed below:

- Architectural Education and ICT
- Building Information Modeling
- Construction Ethics
- Energy efficiency and Conservation
- Environmental Conservation
- Facility Management
- Green Construction and Efficiency
- Health and Safety Issues
- Information Technology and Building Maintenance
- Information Technology and Construction
- Information Technology and Design
- Innovative Infrastructure Development
- Resilient Housing Development
- Smart Cities Development
- Social Integration in Cities
- Sustainable Building Materials Development
- Sustainable City Growth
- Sustainable Cost Management
- Sustainable Property Taxation
- Sustainable Architectural Design
- Sustainable Urban Transportation Systems
- Theory and Practices for Cost Effectiveness in Construction Industry
- Urban Ecology Management
- Urban Land Access
- Disasters, Resilient Cities and Business Continuity

We hope you enjoy your time at our conference, and that you have the opportunities to exchange ideas and share knowledge, as well as participate in productive discussions with the like-minded researchers and practitioners in the built environment and academia.

Local Organising Committee
School of Environmental Technology International Conference (SETIC) 2018
APRIL 2018

ACKNOWLEDGEMENTS

We have tried to build on the success of the maiden of SETIC held in 2016 which came with good feedbacks and memories. The success of the 2nd School of Environmental Technology International Conference holding at the Main Campus of the Federal University of Technology Minna, Nigeria is predicated on the support and goodwill from Vice-Chancellor of Federal University of Technology, Dean School of Environmental Technology and many other highly motivated people.

I sincerely wish to appreciate you for attending this Second edition of SETIC and to warmly welcome you to the city of Minna the capital of the *POWER STATE.* It is a great honour to have you in the beautiful campus of Federal University of Technology Minna, Nigeria. I am aware of the great sacrifices made by many of you to be present in this occasion and I will definitely not overlook the long distances some of you have had to cover to get to the conference venue. We genuinely appreciate all your efforts. It is our singular hope and desire that this 2nd edition of the conference (SETIC 2018) meets your expectations and gives you unquantifiable experience and tremendous developmental networking opportunities for a life fulfilling career.

We are grateful for the presence of the Vice Chancellor of the Federal University of Technology Minna Professor Abdullahi Bala whose leadership and distinguished academic career has served as inspiration and encouragement to many academics within and outside Nigeria. His desire to continue on the path of greatness for this Humble University of ours has seen the University become a destination for International conferences, Public lectures, Book Development, Presentations and Seminars that meet International standards. We are happy to have you as the Chief host to declare the conference open and deliver the welcome address.

We are grateful to the former Dean of School of Environmental Technology, Federal University of Technology Prof A.M. Junaid and the Ag. Dean of School of Environmental Technology Prof. S.N. Zubairu for providing the healthy platform, academic backing, management and guidance for the organisation of the conference. You increased the level of challenge from 2016 and provided the required resources, direction, energy and strategies for achieving its success, it is a great honour of having the opportunity to work closely with you and learning never to give up.

I wish to thank also all the special guests particularly leaders of the Industry, Built Environment and Academia.

A special thanks goes to the Bursar of Federal University of Technology, Mrs. Hajara Kuso for the timely responses to all our requests regarding the financial aspects of access to funds for the conference.

SETIC is beginning at the foundation this year and for this I wish to thank all those who have supported us through various forms of participation. Specifically I wish to thank the delegates and the partners for contributing significantly to the conferences. I wish to thank Prof. S.N. Zubairu Prof. A.M. Junaid, Prof. O. O. Morenikeji and Prof. Y.A Sanusi, who all genuinely and consistently monitored the progress of the conference preparations. My desire in 2016 was for SETIC to become a constant feature in the calendar of the University and global conference listings, am a happy person today seeing this desire fulfilled with the SETIC 2018 edition.

Delegates to SETIC 2018 are from different academic and research institutions that are spread across different countries. This offers participants a wonderful opportunity for exchange of cultural, social and academic ideas during the conference periods. It is also an opportunity to create awareness about programmes and events at the participants' individual institutions. I encourage you all to make good use of the networking opportunities that are available.

In this 2nd edition we received 258 abstract submissions because we had a wide distribution outlet as compared to the 1st edition which is an indication of growth. Using a rapid review system we accepted a total of 209 abstracts and the authors were communicated on what issues they were to examine while developing the full papers based on their titles and aim of the paper. Two hundred (200) full papers were received and reviewed. We sent back the reviewed papers and reviewers comments forms to each of the prospective authors to assist

in the preparation of the revised papers. It was after this rigorous and time consuming process that we were able to accept 172 papers for presentation at the conference. It gives me great joy therefore to congratulate all the authors whose papers made it to the conference. It is my sincere believe that the presentation of the different ideas in your paper would go a long way in improving the knowledge of the participants and also generate meaningful discussions over the tea beaks, lunch and beyond.

I wish to express my utmost gratitude to each of the Seventy-three (73) reviewers for a wonderful job done well and for tolerating our deadlines and Oliver Twist syndrome. It is your dedication and expertise that has ensured that the conference is a success.

Special thanks to all our keynote speakers, Arc. Umaru Aliyu, (ficiArb, fnia, ppnia) (*President, Architects Registration Council of Nigeria (ARCON)*, Prof. Stella N. Zubairu (*Former Dean Postgraduate School, Federal University of Technology Minna*), Dr. Julius A. Fapohunda, (*Editor-in-Chief: International Journal of Sustainable Energy Development & Leader: Sustainable Building and Urban Growth Research Unit, Cape Peninsula University of Technology).*

It is important to appreciate the roles and efforts of the following people for their selfless and very significant contributions made towards the successful organization of the conference: Oyetola Stephen, Alonge Olubunmi, Lynda Odine, Adedokun John, Idowu Oqua, Bamidele Eunice and Muhina Lami (for being available to run around at very short notice),

The organisation of this conference would not have been this easy without dedicated individuals offering to serve. My heartfelt gratitude goes to Dr. Taibat Lawanson, Dr. R.A. Jimoh, Dr. L.O. Oyewobi, Dr. N.I. Popoola, Dr. Lekan Sanni, Dr. I.B. Muhammad, Dr. A.A. Shittu and Dr. A. Saka for their unflinching support all through the process.

It is our sincere hope that this conference will serve as a forum for the advancement of research in the urban sphere towards achieving a sustainable environment. It is our sincere believe that academics and professionals in practices will continually participate in this forum.

Worthy thanks goes to the members of the Local Organising Committee for the tireless effort. The success of the conference goes to these wonderful people. You have made SETIC 2018 to ROCK.

Once again I wish to thank you all for creating time out of your busy schedule to attend this conference. Please do enjoy your stay at Federal University of Technology Minna, and the city as a whole. Ensure that you make use of the different fora created throughout the conference to build new relationships for the future and strengthen existing relationships. I look forward to seeing you all in future.

Olatunde Folaranmi ADEDAYO
SETIC 2018 LOC Chairperson
APRIL 2018

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DECLARATION

PEER REVIEW AND SCIENTIFIC PUBLISHING POLICY STATEMENT

10th APRIL 2018

TO WHOM IT APRIL CONCERN

I wish to state that all the papers published in SETIC 2018 Conference Proceedings have passed through the peer review process which involved an initial review of abstracts, blind review of full papers by minimum of two referees, forwarding of reviewers' comments to authors, submission of revised papers by authors and subsequent evaluation of submitted papers by the Scientific Committee to determine content quality.

It is the policy of the School of Environmental Technology International Conference (SETIC) that for papers to be accepted for inclusion in the conference proceedings it must have undergone the blind review process and passed the academic integrity test. All papers are only published based on the recommendation of the reviewers and the Scientific Committee of SETIC

Names and individual affiliation of members of Review and Scientific Committee for SETIC Conference 2018 are published in the SETIC 2018 Conference Proceedings and made available on www.futminna.edu.ng

Olatunde Folaranmi ADEDAYO
Chairman SETIC 2018
Federal University of Technology, Minna, Nigeria

Papers in the SETIC 2018 Conference Proceedings are published on www.futminna.edu.ng.

REVIEW PANEL

We wish to express our deepest and sincere gratitude to the following people in no particular order who provided comprehensive scientific reviews and made commendable suggestions towards improving the over 258 abstracts and 182 full papers submitted to SETIC 2018. They provided constructive comments to authors regarding their papers, it is necessary to state that there was no reported case of conflict of interest by any of the reviewers or the authors.

Prof. Lekan Sanni,	Department of Urban and Regional Planning, University of Ibadan, Ibadan
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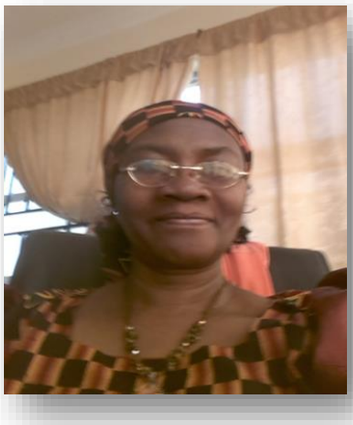
PROFILE OF KEYNOTE SPEAKERS

SETIC 2018 organisers wishes to thank our keynote speakers for accepting to create time to share from their rich wealth of knowledge and interact with delegates and participants on varied issues being examined at this year's conference. A brief profile of each keynote speaker is provided here, this would allow for future interaction and networking with them.

Prof. ZUBAIRU, Stella Nonyelum
Federal University of Technology, Minna

Academic Qualifications: PhD (Building Maintenance, 1999); MSc (Facilities Management, 1989); BArch (Architecture, 1980).
Professional Registration: Registered Architect with Architects Registration Council of Nigeria (F/483, 1985); Member, Nigerian Institute of Architects; Member, International Federation of Facilities Managers.
Contact email stellazubairu@gmail.com; stellazubair@futminna.edu.ng



Prof Stella Nonyelum Zubairu is a lecturer in the Department of Architecture, School of Environmental Technology, at the Federal University of Technology, Minna, Niger State, Nigeria. She obtained a second class upper division degree (BArch) in Architecture from the University of Nigeria, Enugu Campus in 1980. She served in the National Youth Service Corps in Niger State Housing Corporation, Minna, after graduation (1980 -1981), then she worked briefly for a private architectural firm, SWACON, in Lagos before joining the Niger State Ministry of Housing and Environment in 1983 as an architect II. The Ministry later merged with the Ministry of Works and was renamed Ministry of Works and Housing. She rose through the ranks in the Ministry and reached the position of principal architect. During this time, she was involved in many projects in the State including the design and construction of the Government House, extension of the Governor's office, supervision of all health projects in the State and later the design and construction of the Old Peoples' Home and other social welfare projects in the State. In 1988, she was granted study leave to go to Strathclyde University, Glasgow, where she obtained an MSc degree in Facilities Management in 1989. In 1991 she left the Ministry to join the Federal University of Technology, Minna as a lecturer I. In 1995 she was granted a study fellowship to study for her PhD at the University of Lagos which she completed in 1999 with a PhD in Building Maintenance. She was appointed Head of the Department of Architecture, Federal University of Technology, Minna (1999 – 2006). She was promoted to the rank of professor in October 2006. She served as Deputy-Dean Postgraduate School (2008); then she was appointed as Director, Centre for Human Settlements and Urban Development (2008 – March 2011) in the same University. She was then appointed Dean of the Postgraduate School (March 2011 – March 2015).

SCHOOL OF ENVIRONMENTAL TECHNOLOGY INTERNATIONAL CONFERENCE (SETIC) 2018 PROGRAMME

DAY ONE	**TUESDAY**	**10TH APRIL 2018**			
	07.30 – 09.00	**REGISTRATION**			
	09.00 – 10.50	**OPENING SESSION (SET LECTURE THEATRE)** **Chairman Opening Session: Prof. S.O.E. Sadiku Former Deputy Vice- Chancellor, Federal University of Technology Minna**			
	09.00 – 09.05	Welcome and Introduction of Delegates and Guest – **Olatunde Adedayo**			
	09.05 – 09.10	University Anthem			
	09.10 – 09.15	Welcome Address by the Dean, School of Environmental Technology, Federal University of Technology, Minna **– Prof. S.N. Zubairu,**			
	09.15 – 09.25	Recognition of Conference Reviewers			
	09.25- 09.35	Presentation of 100 Years Book **– Prof. S.N. Zubairu,**			
	09.35 – 09.45	Developing Unique gifts items using Paper Art **- D.O. Hans**			
	09.45 – 09.50	Opening ceremony Chairman Speech **- Prof. S.O.E. Sadiku**			
	09.50 – 10 00	Goodwill Messages			
	10.00 – 10.10	Keynote Speech by President Architects Registration Council of Nigeria (ARCON) - **Arc. Umaru ALIYU**			
	10.10 – 10.25	Conference Opening Speech and Declaration by the Chief Host: Vice-Chancellor of Federal University of Technology, Minna, Niger State, Nigeria - **Prof. Abdullahi BALA**			
	10.25 – 10.45	**CONFERENCE LECTURE** **Intelligent Buildings and Green Buildings –Which Way for Nigeria?** **- Prof. Stella N. ZUBAIRU**			
	10.45 – 10.50	Close of Opening Ceremony and SETIC 2018 Group Photographs			
	10.50 – 11.10	**TEA BREAK**			
	11.15 – 12.05	**PLENARY SESSION I** **Chairman of Session: Prof. M.G.M. Kolo, Dean Postgraduate School, Federal University of Technology, Minna** **Session Rapporteur:** ***Dr. R.A. Jimoh, Federal University of Technology, Minna***			
	11.15 – 11.45	**Plenary Paper I** **Promotion of professional degree programmes in Engineering and Built Environment fields.** ***Dr Julius Ayodeji Fapohunda, Editor-in-Chief: International Journal of Sustainable Energy Development***			
	11.35 – 11.55	**Q&A Dr. R.A. Jimoh**			
	11.55 – 12.05	**Session Chair Remarks**			
	12.05 – 12.15	**Split to Parallel Session**			
		PARALLEL SESSION 1			
	12.15 – 12.55	STREAM 1 (LECTURE THEATRE 1)	STREAM 2 (LECTURE THEATRE 2)	STREAM 3 (PG SEMINAR ROOM)	STREAM 4 (SET BOARDROOM)
	Chair	**Prof. M.G.M. Kolo**	**Prof. A.M. Junaid**	**Prof. Y.A. Sanusi**	**Prof. S.N. Zubairu**
	Rapporteur	***Dr. R.A. Jimoh***	***Dr. O.A. Kemiki***	***Dr. A.D. Adamu***	***Dr. P Ayuba***
	Theme	**Environmental Conservation**	**Theory and Practices for Cost Effectiveness in Construction Industry**	**Sustainable Building Materials Development**	**Sustainable Architectural Design**
	12.15 – 12.25	Socio-Economic Impact of Fadama III Programme in Tunga-Kawo Irrigation Scheme, Wushishi Niger State, Nigeria *Olaseni G.O. and Musa Dalil*	Restructuring the Construction Industry and the Built Environment in Africa: A Polycentric Environmental Planning Strategy *Samson R. AKINOLA*	Early-Age Properties of Sorghum Husk Ash and Calcium Carbide Waste Binder In Mortar *C. I. Egwuda, I. O. Hassan, B. J. Olawuyi, & M. O. Enejiyon*	Integrating Cultural Identity to Broadcasting Station Design in North Central Nigeria: Perception of Broadcast Station Workers *Bamidele, I. And Akande, O.K.*
	12.25-12.35	Evaluation of Waste Management Practices in Garment Factories, Kaduna, Nigeria	Perception of Drug Abuse on Productivity of Construction Site Workers in Minna, Niger State	Compressive Strength of Revibrated Concrete Using Sawdust Ash from Selected Wood Species as Partial	Crowd Control in Public Building Designs: Current Trend and Strategies for Ecclesiastical

		Demide A.R and Isah A. D	*Bamgbade Adebisi Abosede, Amos Kelechi Goodluck, Okosun Blessing, Akanbi Memunat Oyiza*	Replacements for Cement *Auta, S.M., Agie, V.N. & Alhassan, M.*	Buildings in Abuja, Nigeria *Ikibe J. H. and Akande, O.K.*
	12.35 – 12.45	Exploring the Tourism Potentials of Cultural Landscape of Nupe Communities in Central Nigeria *Isyaku Mahmud & Isa Bala Muhammad*	Evaluation of Factors Affecting Labour Productivity in Selected Building Construction Sites in Abuja Metropolis, Nigeria *M. O. Peter and D. A Muazu*	Affordable Housing in Nigeria Using Alternative Building Technologies and Materals: A NBRRI Perspective *Danladi Slim Matawal, Nwanade Ocean, Chukwuma Gerald, And Aliyu Kawu*	Adaptation of Interior Design as a Therapeutic Tool in Paediatric Hospitals in Federal Capital Territory, Nigeria *Ummi Hamidu Mai*
	12.45 – 12.55	Q&A			
	12.55 – 13.50	**LUNCH**			
	13.50 – 15.15	**PARALLEL SESSION 2**			
		STREAM 1 (LECTURE THEATRE 1)	STREAM 2 (LECTURE THEATRE 2)	STREAM 3 (PG SEMINAR ROOM)	STREAM 4 (SET BOARDROOM)
	Chair	**Dr. A. Saka**	**Dr. Samsideen Ojoye**	**Dr. Nasir. Abdulkarim**	**Dr. J.T. Kur**
	Rapporteur	***Dr. M.T.A. Ajayi***	***Dr. Hassan Ogiri***	***Dr. D. Opaluwa***	***Dr. E. Ogunbode***
	Theme	**Architectural Education and ICT Information Technology and Building Maintenance**	**Health and Safety Issues Information Technology and Construction**	**Smart Cities Development**	**Resilient Housing Development Innovative Infrastructure Development**
	13.50 – 14.00	Creative Art and Transformative Development in Architecture Nexus: A Case of Federal University of Technology Minna *A .S. Alfa*	Effect of Health and Safety Management Practices on Safety Performance of Construction Contractors *David B.R., Idiake J.E. & Shittu A.A.*	Prospects and Challenges of Smart City Development in Nigeria *Nda, Khadijat Yakubu &Babah, Bishara Musa*	Study of Residents' Satisfaction with Housing Conditions in Urban Centres of Southwest Nigeria *Mukaila El-Hussain Abdulrahman*
	14.00 – 14.10	Users' Perception Of Informal Interaction Spaces In Research Institutes in the Federal Capital Territory, Nigeria *Otu Muhammad Adeiza & Isa Bala Muhammad*	Assessment of Pattern of Accident Occurrence on Building Construction Sites in Abuja, Nigeria *Adeniyi, K. E. & Mohammed Y. D.*	Exploring Factors that Contributes to Residential Environment Liveability In Minna, Niger State *Sule Abass Iyanda, Ojetunde Ismail, Morenikeji Gbenga, & Abdulkareem Sekinat*	Micro-Housing Development as Feature of Class Stratification in the Jos Metropolis of Plateau State, Nigeria *Sulyman, A.O And Kudu, S.E.*
	14.10 – 14.20	Q&A			
	14.20 – 14.30	Trends, Problems and Prospects of Computer & ICT in Architectural Education and Practice In Nigeria *Abdulwahab Engworo Etudaiye, Precious Ugochukwu & Abubakar Adamu Girei*	Impact of Safety Managers' Leadership Styles on Workers Safety Behavior on Construction Site in Abuja *Ajala J. O.& Mohammed Y. D.*	Analysis of Livelihood Diversification in Peri-Urban Settlements Of Minna *Gimba S. L. & Sanusi Y.A*	Assessment of User Satisfaction as a Basis for Sustainable Housing Provision in Nigeria *OCHEPA Yahaya Sadiq*
	14.30 -14.40	Proposed Architectural Curriculum Framework for Sustainable Development *Mudashir Gafar And*	Assessment of Health and Safety Measures in Selected Basic Schools in Abuja *UGBAN, Nguseer Cynthia & OLASENI, Gbenga Olaolu*	Investigation of Space Flexibility Principles in the Design of Student's Social Centres *Aliyu Usman*	Integrated Approach: A Sustainable Strategy to Adequate Housing Provision by the Urban Poor in Lokoja, Nigeria

		Abubakar Abdullah			*Amlogu G. Y. & Sulyman A.O.*
	14.50 – 15.00	Facility Maintenance Management Plan – A Case Study of Kashim Ibrahim Library, Ahmadu Bello University, Zaria *Musa Sylvanus Hassan*	Impact of Information and Communication Technology (ICT) Facilities Deployment on Quantity Surveying Practice in Abuja *Alabi, T. T. & Anifowose, O. M.*	Integration of Recreational Spaces in Abuja Commercial Centres Designs *ZAKARI Nathaniel Sunday*	Effects of Infrastructure Provision on Residents of Selected Private and Public Housing Estates in Lokoja Metropolis, Nigeria *Okpanachi, M. & Zubairu, M.*
	15.00 – 15.10	Q&A			
	15.10 – 15.15	**Session Chair Remarks**			
	15.15 – 15.25	**SNACK BREAK**			
	15.25 – 16.55	**PARALLEL SESSION 3**			
		STREAM 1 (LECTURE THEATRE 1)	STREAM 2 (LECTURE THEATRE 2)	STREAM 3 (PG SEMINAR ROOM)	STREAM 4 (SET BOARDROOM)
	Chair	**Dr. M.B. Nuhu**	**Dr. M.T.A. Ajayi**	**Dr. P. Ayuba**	**Dr. O.A. Kemiki**
	Rapporteur	***Dr. Abbass***	***Dr. I.B. Muhammad***	***Arc. Oyetola***	***Dr. B.J. Olawuyi***
	Theme	**Theory and Practices for Cost Effectiveness in Construction Industry**	**Sustainable Property Taxation** **Sustainable Architectural Design**	**Sustainable Cost Management**	**Sustainable City Growth**
	15.25 – 15.35	Cost Implications of Rework due to Design Errors in Institutional Building Projects in Abuja *C. Salihu & A.D. Adamu*	Estate Surveyors' Perspectives on Residential Property Tenancy Determination in Ilorin Metropolis *Ibrahim Tajudeen Akogun, Olatoye Ojo, Agava, Yusuf Halim, Adeogun Sunday Adekunle*	Factors Responsible for Variation in Cost of Mechanical and Electrical Services in Building Projects in Nigeria *Ladan, M. & Shittu A.A*	Spatial Variation of Factors Influencing Neighbourhood Change in the Peri-Urban Areas of Minna, Niger State *Idowu, O. O., Shaibu, S. I.; Bako , A. I. Raheem, W. A. & Martins, V. I.*
	15.35 – 15.45	Evaluation of the Nigeria Construction Industry Preparedness to Adopt Supply Chain Management Practices *Abah, E. & Adamu A. D.*	Residential Property Investment Returns Inequalities in Ilorin *A.S. Adeogun, M.B. Nuhu, N.B. Udoekanem, N.I. Popoola, M.B. Wahab, and W.O. Shittu*	Impact of Contractual Claims on the Performance of Public Building Projects in Nigeria *Saidu, J. K. And Oyewobi, L.O.*	Assessment of The Application of Crime Prevention Through Environmental Design (CPTED) in Residential Estates in Minna *Idris Attahiru Muhamad, Sarah Kakajiya Goshi & Isa Bala Muhammad*
	15.45 – 15.55	Q&A			
	15.55 – 16.05	Evaluating the Current Teaching Techniques to the Nigerian Undergraduate Quantity Surveying Students *Saidu I., Nkollo O.W., Danjuma M. & Shakantu W.*	Effectiveness of Passive Design Features in Active Security Installation in Large Shopping Centres in Abuja, Nigeria *Bamidele Oluwatosin Eunice, Adedayo O.F.*	Effect of Contractual Risks on Building Contracts in Abuja, Nigeria *Alhaji, Lawal Haruna & Muhammad, Yakubu Danasabe*	Improving and Sustaining Access to Water and Sanitation in Nigeria: Opportunities and Constraints *Gognaje, Sunday Barde*
	16.05 – 16.15	Assessment of Labour Productivity and Construction Workers Wages on Active Sites in Minna *O. A. Obanibi, and D. A. Muazu*	Assesement of Student Satisfaction with Provision of Recreational Spaces in Faculty Buildings in Public Universities in North Central Nigeria *Nasirdeen M. Y. & Adedayo, O.F.*	Assessment of the Cost Implication of Reviving Abandoned Public Projects in Abuja, Nigeria *Saleeman Yinusa & Anifowose, Opeyemi Maroof*	Achieving a Sustainable City Growth Through Neighbourhood Levels in Bosso Estate, Minna Niger State *S.I. Shaibu, S.O. Medayese, O.O. Idowu, P.O. Abah And G.S. Owoyele*
	16.15 – 16.25	Q&A			

	16.25 – 16.35	Assessment of Leadership Capability in the Nigerian Construction Industry for Effective Project Delivery *Akinsanya, A.Y., Olanrewaju O. D., Ikegwu E. M. & Oke, E.*	Adaptive Reuse Design Consideration in Campaign Office Buildings in Minna, Niger State *Jimoh, Rukayat Olajumoke, Abdulrahman, M. E.*	Impact of Money on Price Direction of Building Materials in Abuja *Omoboye, Olayinka Gideon & Anifowose, Opeyemi Maroof*	Appraisal of EU Financed Rural Water Supply Project in Selected Communities in Akwa Ibom North Senatorial District, Nigeria *Edem, E. Essien, Mohammed B. Banki & Ohadugha, C. B*
	16.35 – 16.45	Effect of Motivation Strategies on Labour Output of Small and Medium Construction Contractors in Nigeria *Uzoma, C. N., Shittu, A. A. & Oke, A. A.*	Assessing User Perception on the Efficiency of Passive Security Control Measures in Modern Public Secondary Schools in Minna, Niger State *Omeje, S.C. & Olaniyan, O.A.*	Developing Building Cost Indices Using Federal High Court Projects of 2007 to 2016 *Wakili, Abubakar & Ibrahim, Ahmed Doko*	Neighbourhood Crime Vulnerability Mapping in Ilorin, Nigeria *Lekan Mohammed Sanni*
	16.45 – 16.55	Q&A			
	16.55 – 17.05	**CLOSE**			

DAY TWO	**WEDNESDAY**	**11TH APRIL 2018**			
	08.40 – 09.00	**Highlights of Day One** ***Dr. R.A. Jimoh***			
	09.00 – 09.55	**Plenary Paper II** **Chairman of Session: Prof. O.O. Morenikeji, Department of Urban & Regional Planning, Federal University of Technology, Minna** **Session Rapporteur: Dr. B. Ganiyu, Federal University of Technology, Minna**			
	09.00 – 09.05	**Session Chairman Remarks**			
	09.05 – 09.45	**WORKSHOP SESSION I** **Research method best practice- The Approach to achieve Valid and Reliable Findings Part 1** **Dr Julius Ayodeji Fapohunda, Editor-in-Chief: International Journal of Sustainable Energy Development**			
	09.45 – 09.55	**Q&A Dr. B. Ganiyu**			
	10.00 – 11.00	**PARALLEL SESSION 4**			
		STREAM 1 (LECTURE THEATRE 1)	STREAM 2 (LECTURE THEATRE 2)	STREAM 3 (PG SEMINAR ROOM)	STREAM 4 (SET BOARDROOM)
	Chair	**Dr. A. Abdulkadir**	**Dr. Mairo Mohammed**	**Dr. R.A. Jimoh**	**Dr. R. Ojutiku**
	Rapporteur	***Dr. Owoeye***	***Dr. Abdulrahman***	***Dr. Anifowose***	***Dr. Hassan Ogiri***
	Theme	**Sustainable City Growth**	**Social Integration in Cities**	**Energy Efficiency And Conservation**	**Urban Ecology Management**
	10.00– 10.10	Users Perception in the Planning of Markets: A Case Study of Abuja, Nigeria *Muhammad Abubakar Sadiq*	Social Capital: A Poverty Reduction Mechanism in Minna, Niger State, Nigeria *Martins V. I., Sanusi Y. A., Akande S. O., Mohammed N. & Adeleye B. M.*	Determinants of Households Domestic Cooking Energy Choice and Technology in Minna, Niger State Nigeria *Ohadugha, C. B.; Sanusi, Y.A; Morenikeji, O.O; Zubairu, M. & Olaide, A.*	Assessment of Recreational Spaces in Public Secondary Schools, Minna, Niger State *Hassan, B. Y. & Yelwa, M. U.-K*
	10.10 – 10.20	Urban Development Control as a Viable Measure for Achieving Sustainable Development Goals *Nasiru, S., Kemiki, O.A., Emmanuel, S.G.*	Appraisal of The Role of Informal Economic Enterprises in Minna, Nigeria *Ibrahim, Bilkisu and Kawu, A.M*	Passive Techniques for Energy Conservation in Hotel Buildings in Minna, Nigeria *Zhiri, G. H. & Akande, O. K.*	Livelihood Opportunities in Solid Waste Recycling in Kaduna Metropolis, Nigeria *Shaibu, S. I.; Nwamuo A. G. and Medayese, S. O.*
	10.20 – 10.25	Q&A			
	10.25 – 10.35	Challenges Facing the Development of	Livelihood Opportunities from the Periodic Markets	Analysis of Energy Poverty in Rafi Local	Spatial Inequality in Environmental Amenities

		Sustainable Petrol Filling Stations in Minna, Niger State- Nigeria *Aisha Panti ABDULLAHI and Olatunde Folaranmi ADEDAYO*	in Eastern Part of Niger State, Nigeria *Mbaukaan Eric Iormba & Sanusi Yekeen Adeeyo*	Government Area of Niger State, Nigeria *Akande S.O., Sanusi Y.A., Mohammed N., & Ohadugha C.B.*	Distribution in Bida, Niger State, Nigeria *Mohammed N., Sanusi Y. A., Akande S. O., Adeleye B. M., Ohadugha C. B., Mohammed M.*
	10.35 – 10.45	Design Considerations for Crime Prevention through Environmental Design in Minna Shopping Centres *Jatto .A. Ibrahim & M.E. Abdulrahman*	Analysis of Do It Yourself (DIY) Approach in a Neighbourhood Community Sanitation Project in Sokoto Metropolis *Ashiru Bello*	User's Satisfaction Level With Passive Cooling Design Techniques in Public Secondary Schools Minna, Nigeria *Isijola Deborah Boluwatife, Adedokun John & Goshi Sarah Kakajiya*	User Satisfaction with Organic Architecture Design Considerations in Hospital, Abuja *Ajiboye Oluwaseun Charles , and M.UK Yelwa*
	10.45 – 10.50	Q&A **Session Chair Remarks**			
	10.55 – 11.15	**TEA BREAK**			
	11.15 – 13.00	**PARALLEL SESSION 5**			
		STREAM 1 (LECTURE THEATRE 1)	STREAM 2 (LECTURE THEATRE 2)	STREAM 3 (PG SEMINAR ROOM)	STREAM 4 (SET BOARDROOM)
	Chair	**Dr. I.B. Muhammad**	**Prof. Musa Ahmed**	**Prof. A.M. Junaid**	**Dr. Joy Maina**
	Rapporteur	***Dr. A.D. Adamu.***	***Dr. Isa Aka***	***Dr. R. Babtunde***	***Dr. A.I. Sule***
	Theme	**Sustainable Architectural Design**	**Sustainable Urban Transportation Systems**	**Energy Efficiency And Conservation**	**Disasters, Resilient Cities And Business Continuity** **Sustainable Geomatic Tools And Techniques**
	11.15 – 11.25	Elements of Architectural Design and Interpretation of Buildings and Monuments in Kaduna State *Isa Sani Mohammed, Anas Muhammad & Aisha Wali Aminu-Umar*	Commuters' Assessment of Intra-City Bus Service in Kaduna Metropolis, Nigeria *Oluwole Matthew Sunday & Tolufashe Stephen Afolabi*	Integrating Natural Lighting Design Approach to Library of Public Universities in North Central Nigeria *Mukaila Elhussein Abdulrahman & Ibrahim Charles Adejoh*	Post-Resettlement Changes and Adjustment: A Case Study of Sabon Wuse in Niger State, Nigeria *Sulyman, A.O And Kudu, S.E.*
	11.25 -11.35	Assessment of User Centered Design Approach in Schools of Architecture, Nigeria *David Odinya Emmanuel & Oluwafemi Kehinde Akande*	Users Circulation Satisfaction in Nnamdi Azikiwe International Airport (NAIA) Terminal Building Abuja, Nigeria *Yabagi M. & Isah A. D.*	Energy Consumption Pattern Among Households in Minna Metropolis, Niger State, Nigeria *Akanmu, W. P.; Jimoh, I.A. and Bajere, P. A.*	Institutional and Community Awareness on the Environmental Impact of Municipal Solid Waste Management in Bida Metropolis, Nigeria *Yahaya, U.; Abd'razack, N.T.A. & Mohammed, M.*
	11.35 – 11.40	Q&A			
	11.40 – 11.50	Assessment of Design Features for Circulation in General Hospitals in Kogi State, Nigeria *Ocheje, Eneojo Abdulmunin And Olagunju, R. E.*	Assessment of Circulation Safety Design Features in Train Terminal Buildings in Nigeria *Adeboh, David & Olagunju, R. E.*	Evaluation of Thermal Comfort in School Of Environmental Technology Complexes in Selected Government Owned Universities in South East Nigeria *Eze, Chukwudum Jasper & Okoro Emmanuel Ijioma*	Development Control: A Strategy for Flood Vulnerability Assessment In Suleja *Adeleye, B.M[1], Zitta, N[2], Popoola, A.A. and Ayangbile, O. A.*
	11.50 – 12.00	Assessment of Design Features for Crowd Control in	Assessment of the Extent of Traffic Congestion in	Assessment on the Extent of Passive Cooling Strategies	Towards resilient in Design and Construction of

		Sport Centres In Nigerian Universities *Grace Olushola Jaiyeola, Isa Bala Muhammad & Olagunju R.E*	Selected Traffic Appian in Minna, Nigeria *Medayese S. O, Abd'razack, N.T.A & Ajumobi O.*	Integration in Public Centers Ado-Ekiti, Ekiti State, Nigeria *SANTHUS Ericson Beshel*	Housing in Coastal Area of Lokoja, Nigeria *Abdulmutalib Ohinoyi Ibrahim & Ochepa Yahaya Sadiq*
	12.00 – 12.10	Integration of Crowd Control Mechanisms in Civic Centre Design in Kaduna State, Nigeria *Izigah Sunday Anthony & Abubakar Danladi Isah*	Spatial Analysis of On-Street Parking in Kpakungu Area of Minna, Nigeria *Medayese, S. O., Musa-Daud F.A & Matins, V.I.*	Using Waste Heat Recovered from Household Refrigerator to Heat Water for Domestic use *MUSA Nicholas Akhaze, AKINBODE Folorunsho Olayiwola & NJOKU, Benedicta Chidinma*	Geospatial Information Systems Solutions to the Consequences of Modernization and Technological Advanvements On The Built Environment *Onuigbo, Ifeanyi Chukwudi*
	12.10 – 12.20	Q&A			
	12.30 – 12.40	Impacts of Therapeutic Environments on the Recovery Process of Patients in Healthcare Facilities in Nigeria *Uzoh Oghor Jewel*	Road Passengers' Perception on the Quality if Bus Terminal Facilities in Nigeria *Edikan B. & A.D. Isah*	A Review of Literatures on Energy Performance in Low Income Housing, Using Retrofiting Techniques in View of Optimizing Energy Efficency *Mbohok, O. E. and Akanmu,W. P.*	A Method for Assessment of Optimal Choice of Parametric Model in Least Squares Collocation *Odumosu, J.O., Onuigbo, I.C., Nwadialor, I.J. And Kemiki, O.A.*
	12.40 – 12.50	Assessment of Courtyard Functions and its Design Considerations in Hospitals in Niger State *Mamud, M.I. And Yelwa, M.U.K.*	Spatial Analysis and Modelling of Campus Shuttle Stops in Federal University of Technology, Akure, Nigeria Nzelibe I. U., Idowu T. O. & Ajayi G. E.	Integration of Biomimicry Principles as a Means to Energy Efficiency in Office Design, Abuja, Nigeria *Abubakar Usman Karofi & Eze J.C.*	Investigation of the Robustness of Different Contour Interpolation Models for the Generation of Contour Map and Digital Evelation Models *Kuta A. A., Ajayi O. G., Osunde T. J., Ibrahim P. O., Dada D.O. & Awwal A. A.*
	12.50 – 13.00	Q&A **Session Chair Remarks**			
	13.00 – 13.55	**LUNCH**			
	14.00 – 15.35	**PARALLEL SESSION 5**			
		STREAM 1 (LECTURE THEATRE 1)	STREAM 2 (LECTURE THEATRE 2)	STREAM 3 (PG SEMINAR ROOM)	STREAM 4 (SET BOARDROOM)
	Chair	**Prof. S.N. Zubairu**	**Dr. B. Ganiyu**	**Dr. J.E. Idiake**	**Dr. L. Sanni**
	Rapporteur	***Dr. Ayuba***	***Arc. Oyetola***	***Dr. N.I. Popoola***	***Dr. I. Saidu***
	Theme	**Sustainable Architectural Design**	**Social Integration in Cities** **Sustainable Cost Management**	**Sustainable Cost Management**	**Facility Management**
	14.00 – 14.10	Design Considerations for Pedestrian Circulation Control in General Hospitals, Abuja *Okonkwo Emmanuel Obinna And Isa Bala Muhammad*	Assessment of User's Perception of Outdoor Eating Area in Abuja Restaurants *Idris, Ahmad Loko & Mukaila El-Hussain Abdulrahman*	Assessment of Post-Project Review Systems for Construction Projects in Abuja, Nigeria *John, M. And Oyewobi, L. O.*	The Contributory Effect of Externalities to the Void Periods for Residential Buildings in Minna, Nigeria *Ogunbajo, R. A, Adewusi, A. O, Usman, B.S. & Ayoola, A. B.*
	14.10 – 14.20	Evaluation of Integration of Users Needs in Paediatric Ward Designs in General Hospitals in Niger State	Evaluation of Social Interactive Spaces of Shopping Centres in Abuja, Nigeria *Sulyman, O.S. And Akande, O.K.*	Design Firm's Perception on Risk Occurrence and Impact on Construction Project Budget Performance	The Prospects of Facility Management in Real Estate Sector in Nigeria

		Adedokun A. J., Adedayo O. F., Isijola D. B. & Onwuka B. N.		*S.U. Gbate, K.J. Adogbo & H. Musa*	*Emmanuel C. Osuji1, Joshua Daniel Auta, Patricia Ehi Ehoche*
	14.20 – 14.30	Q&A			
	14.30 – 14.40	Integration of Open Spaces in Maternity Hospital Design for Therapeutic Functions in Kaduna, Kaduna State *Mordi, C.Y & Ayuba, P*	Preference and Compatibility: Ageing in Place Limitations in Nigeria *Onanuga Omotayo Adebayo*	Impact Of Wage Differentials On Productivity Of Construction Companies In Abuja *Abdulmalik, Amina & Y. D. Muhammad*	Assessment Of User Satisfaction With Facilities In Rest-Stops Along Kano-Abuja Highway *Abubakar Aisha Sadiq & Shittu Abdulmajeed Olaremi*
	14.40 – 14.50	Adoption of User's Perception of Landscaping Elements for Passive Security in Public Recreational Parks in Nigeria *Ogbonna C. O. & Isah D. A.*	Assessment of Interactive Spaces in High Rise Residential Building in Lagos City, Nigeria *Ogunlowo M. O. & Oyetola S.A.*	Evaluating the Performance of Public Private Partnership in the Delivery of Public Housing Schemes in North Central Nigeria *Oni Olalere Simeon & Adamu Anita Dzikwe*	Evaluation of Health Implication of Off-Campus Residence as a Sustainable Alternative in Tertiary Institutions *Ibok U. Okon, Udomiaye Emmanuel And Odaudu Ugbede Sunday*
	14.50 – 14.55	Q&A			
	14.55 - 15.05	Assessing Flexible Features in the Design Of Event Centres in Minna, Niger State Nigeria *Agah, F. A. & Ayuba P.*	Assessment of the Relationship Between Housing and Livelihood Pattern of Urban Residents of Bida, Niger State, Nigeria *Sulyman A.O. & Dzukogi U.A.*	Stakeholders` Perception of The Causes and Effects of Variation Orders in Public Construction Projects in South-Eastern Region of Nigeria *Emmanuel Tayo Adu & A. Opawole*	User Satisfaction with Informal Space Efficiency in Selected Office Buildings in Lokoja Kogi State Nigeria *Audu Muhammad Onoruiza & Eze Chukwudum J.*
	15.05 – 15.15	Assessment of Passive Security Measures in Hotel Design in Osun State, Nigeria *Jimoh Olawale Uthman & Sarah Kakajiya Goshi*	The Impacts of Microfinance on Livelihoods of Women – A Study of Lapo Microfinance Women Clients in Minna, Niger State, Nigeria *AKANBI, Memunat O. and BAMGBADE, Adebisi A.*	Assessment of Contractors' Perception on the Effect of Cash Flow on Construction Project Delivery *Ali A. A., Idowu Faruq Ayobami & Musa Abdulrasheed Alhassan*	Assessment of Space Provision and Adequacy in Peadiatric Hospital Design: A Case Study of Offa, Kwara State *Lawal Aminat Abiola*
	15.15 – 15.25	Assessment of The Level of Integration of Organic Architecture in Hotel Buildings in Makurdi, Benue State *Icha, Lazarus O. and Arc. Eze, Chukwudum J.*	Impact of Public Procurement Reform on Construction Project Delivery in Kaduna State *ADOGA, Angela Omoyemen and Abdulateef SHITTU*	Strategic Management Initiatives in Small and Medium Scale Construction Companies in FCT Abuja *Olubajo, O. O. & Olawuyi, B. J.*	Post-Occupancy Evaluation of Students Hostel Facilities in Federal Universities in North Central Nigeria *Abdul Christopher Ileanwa & Ayuba Philip*
	15.25 – 15.35	Q&A **Session Chair Remarks**			
	15.35 – 15.50	**SNACK BREAK**			
	15.55 – 16.40	**WORKSHOP SESSION II** **Research method best practice- The Approach to achieve Valid and Reliable Findings Part 2** **Dr Julius Ayodeji Fapohunda, Editor-in-Chief: International Journal of Sustainable Energy Development**			
	16.40 - 16.50	**Q&A Dr. O. A. Kemiki**			
	16.50 – 17.15	CLOSE			

DAY THREE	**THURSDAY**	**12TH APRIL 2018**			
	08.40 – 09.00	**Highlights of Day Three Dr. I.B. Muhammad**			
	09.00 – 10.20	**PARALLEL SESSION 6**			
		STREAM 1	STREAM 2	STREAM 3	STREAM 4 (SET BOARDROOM)

		(LECTURE THEATRE 1)	(LECTURE THEATRE 2)	(PG SEMINAR ROOM)	
	Chair	**Prof. O.O. Morenikeji**	**Prof. A.M. Junaid**	**Prof. Y.A Sanusi**	**Dr. M.B. Nuhu**
	Rapporteur	***Dr. M.T.A. Ajayi***	***Dr. Ayuba***	***Dr. O.A. Kemiki***	***Dr. L.O. Oyewobi***
	Theme	**Sustainable Architectural Design** **Sustainable Urban Transportation Systems**	**Materials and Energy**	**Urban Land Access**	**Green Construction and Efficiency**
	09.00 – 09.10	Assessment of Display Techniques Design Consideration for Car Sales and Service Station Abuja *Aliyu, Musa Chiji and Olagunju, R. E.*	Effect of Calcium Carbide Waste and Groundnut Shell Ash Blended with Cement in Concrete Production *U. Nuhu, T.Y. Tsado, and M. Abdullahi*	Effectiveness of Compulsory Land Acquisition Process in Durumi District, Abuja Nigeria *Kuma, S. S., Fabunmi, F. O., Adamu, S. And Kemiki, O. A.*	Promotion of Green Infrastructures in Nigerian Urban Settlements for Sustainable Development: An Advocacy *Olufemi, J. E. & Nuhu, A.A;*
	09.10 – 09.20	Assessment of Passive Crowd Design Control Considerations in Jumuat Masjids (Mosques), Minna, Niger State *ALIYU Muhammad Baba & EZE J. C.*	Performance Evaluation of Egg-Shells and Cow Bone Ashes as Pozzolana in Concrete Production *Y. Adamu , T. Y. Tsado, &T.W. E. Adejumo,*	Developing an Efficient Urban Land Market in Warri, Nigeria: The Challenges and a Road Map *Bernard Adjekophori*	Perceived Benefits and Potential Challenges of Implementing Green Building Practices in Lagos, Nigeria *Ola, Olumide Samson*
	09.20 – 09.30	Q&A			
	09.30 – 09.40	Evaluation of Crimes, and User's Perception on Preventive Measures in Commercial Buildings in Nigeria *SALAWU,Abdulkareem Muda and Isah Abubakar Danlami*	Sustainability, Resource Consumption and Ecological Footprint of Bida, Nigeria *Oluwafemi Joshua OJO & N.T.A. Abd'Razack*	Access To Residential Land In Minna, Nigeria: Methods And Constraints *Chukwuma C. Nwuba & David Adoga*	Strategies For Material Wastage Mnimization On Building Construction Sites In Kaduna State – Nigeria *Okosun B.O., Oyewobi, L.O., And Odine, L.C.*
	09.40 – 09.50	Intergration of Green Design Principles in Circulation Spaces of Shopping Centers, Ilorin, Nigeria *Oyebode Abdulhafeez Olabode & Isah Abubakar Danladi*	Sugarcane Straw Waste Ash as a Potential Binder in Concrete Production *Ahmed, A. and Amali, N.U*	A Comparison of The Performance of Manual and Digital Land Information System in Kwara State, Nigeria *ADEKOYA Adeola Adesanya, ADEWUSI Amos O.*	Evaluation of an Eco-Friendly Approach for the Physically Challenged People in Nigeria *Dauda C. G. & Akande O. K.*
	09.50 – 10.00	Q&A			
	10.00 – 10.10	Assessment of Passive Security Measures in Senate Buildings of Federal Universities in North Central Nigeria *Egwuma Macaulay*	Integration of BIM Technology into Facilities Space Planning and Management at A Tertiary Educational Institution in Nigeria *Bajere, P. A., Akanmu, W. P. And Jimoh, I. A*	Impact of Peri Urban Growth on Agricultural Land in Minna Suburb *Morenikeji, G., Popoola, N. I., Alfa, M., and Adeleye, B.M*	Evaluating the Barriers in Developing Green Building in Nigerian Construction Industry *Idowu Faruq Ayobami, Salawu Abdulfatai Oyebode & Peter Gangas*
	10.10 – 10.20	Users' Satisfaction of Tricycle as Urban Commercial Transportation in Minna, Nigeria *Owuri Aishat Ize & Aliyu Kawu*	Preference And Compatibility: Ageing In Place Limitations In Nigeria *Onanuga Omotayo Adebayo And Oviasogie Collins O*	Urban Green Infrastructure Planning in Europe and the United States: Lessons for Nigerian Cities *Alabi, A.M. and O.M. Olaniyan*	Evaluation of Design Features for Adoption of Bright Green Concept in Hotels in Minna, Nigeria *Ijege, A. A.*
	10.20 – 10.25	Q&A **Session Chair Remarks**			

	10.25– 10.45	**TEA BREAK**			
	10.45 – 12.45	**PARALLEL SESSION 7**			
		STREAM 1 (LECTURE THEATRE 1)	STREAM 2 (LECTURE THEATRE 2)	STREAM 3 (PG SEMINAR ROOM)	STREAM 4 (SET BOARDROOM)
	Chair	**Dr. L.O. Oyewobi**	**Dr. Anita Adamu**	**Dr. Joy Maina**	**Dr. P. Bajere**
	Rapporteur	***Dr. O.A. Kemiki***	***Dr. R. Babtunde***	***Dr. I.B. Muhammad***	***Dr. C. Ohadugha***
	Theme	**Information Technology and Design** **Theory and Practices for Cost Effectiveness in Construction Industry**	**Sustainable Building Materials Development**	**Building Information Modelling**	**Energy Efficiency And Conservation** **Facility Management**
	10.45 - 10.55	Design and Implementation of a Computerised Battery Analyser *E.N. Onwuka, E.I. Nwankwo, P. Oluwabiyi, A. Nurudeen & S.O. Aliyu*	Effect of Revibration on the Flexural Strength of Concrete, Using Mahogany Sawdust Ash as Partial Replacement for Cement *Auta, S.M., Peter, O. & Saidu, M.*	Building Information Modelling: A Tool for Diffusion of Information in Nigeria *Hamma-Adama, M., Galadima,Y. K. & Kouider, T.*	Application of Courtyard Concept as a Passive Cooling System Case of Artisan Training Institute in North Central Nigeria *Abdul Hakeemat Eneze*
	10.55 – 11.05	Ergonomics of Three-Wheeled Wheelchair as a Mobility-Aid Used in Kano City *Munir Moukhtar Mai*	Effect of Superplasticizer on Setting Time and Strength of Mortar Made Using Rice Husk Ash (Rha) and Calcium Carbide Waste (CCW) as Binder. *M. O. Enejiyon, B. J. Olawuyi, I. O. Hassan, And C. I. Egwuda*	Appraisal of the Extent of BIM Integration in Facility Management Practices in Abuja, Nigeria *M.H. Yunusa, M. Abubakar And M.Abdullahi*	Evaluation of Natural Lighting as a Solution Towards Achieving Sustainability in the Design of Shopping Malls in F.C.T Abuja Municipal Area *Obinna C.Q. and Akande, O.K.*
	11.05 – 11.15	Q&A			
	11.15 – 11.25	Assessing the Performance Trend of Quantity Surveying Students in Core Quantity Surveying Courses in Selected Tertiary Institutions in Niger State *Kure B.A. & Mohammed Y.D.*	Effect of Revibration on the Flexural Strength of Concrete, Using Locust Bean Pod Epicarp Ash as Partial Replacement for Cement *Auta, S.M., Anthony, A.I. & A. A. Amadi*	An Overview of the Km Tools and Techniques Essential for the Development of A BIM Knowledge Framework *Ganiyu Sikiru Abiodun & Egbu Charles*	Assessment of Passive Design Strategies for Energy Efficiency in Office Buildings of Federal Capital Territory Abuja *Olah, C, A. & Olaniyan, O, A.Area*
	11.25 – 11.35	Factors Influencing Rework Occurrence in Some Selected Ongoing Building Project –Abuja *Okwara O. G. & Mohammed Y. D.*	Assessment of the Tourism Potentials of Gurara Waterfalls, Niger State, Nigeria *Musa, U,G., Mohammad, A.M., Abubakar, S., & Abdulrahman, B.I.*	Evaluation of Building Information Modelling (BIM) Software Capabilities that Support Quantity Surveying Practices in Nigeria *ABDULLAHI Abdulrasheed Madugu, ABDULLAHI Muhammad, GUDE Daniel Monday*	Open Spaces Maintenance Practices in Shopping Centres in Kaduna Metropolis Kaduna State *Muhina Lami Ibrahim*
	11.35 – 11.45	Q&A			

	11.45 – 11.55	Analysis of Costs of Rework on Time And Cost Performance of Building Construction Projects in Nigeria *Eze, E. C. & Idiake, J. E*	Performance Evaluation of Outsourced Facility Management Services at Baze University Abuja *Bajere, P. A. & Akor, V. O.*	Building Information Modelling (BIM) as it Relates to the Construction Industry: A Review *SHUAIB Iklimah & SALIHU Suleiman*	The Role of Architecture in Wayfinding Performance in Hospital Buildings in Nigeria *S. Ahmed, R.E. Olagunju, S.N. Zubairu and O.K. Akande*
	11.55 – 11.55	Assessment Of Facilities Condition And Users' Satisfaction In Public Housing Estates In Minna, Nigeria *Hassan Shuaibu Liman*	Structural Integrity of Hollow Sandcrete Block Walls in Federal University of Technology, Minna using Rebound Hammer Test *Sule, Bandagi Ahmed, Abdullahi Mohammed., Alhassan Mohammed*	A Review of Geographic Information Systems Applications to Election Mapping in Nigeria *Okolie, C.J., Adesina, E.A., Irivbogbe, H.E., and Umar, A.A.*	Evaluation of Rainfall Trend in North – Central Region of Nigeria *G. H. Ntat, S. Ojoye, Y. M. Suleiman, A. A Adenle &S. D. Francis*
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	12.15 – 12.35	**Plenary Session 3** Research Collaborations and opportunities in South Africa **Dr Julius Ayodeji Fapohunda, Editor-in-Chief: International Journal of Sustainable Energy Development**			
	12.35 – 12.50	Q&A			
	12.50– 14.10	**LUNCH**			
	14.10 – 14.30	**Conference Summary - Dr. R.A. Jimoh**			
	14.30 – 15.00	**Presentation of Certificate**			
	15.00 – 15.15	CLOSING REMARKS Prof. S.N. Zubairu, Ag. Dean School of Environmental Technology, Minna			
	15.15 – 15.25	Vote of Thanks			
	15.30 – 16.00	**SNACKS AND CLOSE**			

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SECTION 1: KEYNOTE PAPERS

OVERVIEW OF CHALLENGES OF SUSTAINABILITY

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The world is experiencing rapid urbanization in the 21st Century. The challenges of sustainability have become an integral part of our lives.

The concept of Environmental Sustainability has been around now for many years in the construction industry. However, studies indicate that the Construction Industry accounts for significant energy consumption and environmental pollution. According to recent studies Building material manufacture takes up approximately 10% of global energy-use. Up to 40% of global primary energy is consumed as energy-in-use of buildings in the operational phase and in turn these buildings produce about 24% of global CO2 emission. Due to the increase in energy cost and scarcity of natural resource, it has become increasingly important to minimise energy consumption and Green House Gas, GHG, emission attributed to the Architecture, Engineering and Construction (AEC) Sector.

Contemporary concepts such as Building Information Modelling (BIM) Management allows the superimposition of information from the various supplier disciplines within a single model - in a Common Data Environment (CDE). This approach provides the opportunity to introduce and analyse environmentally sustainable enhancement measures at the early stages of the design process.

Our lifestyle is having profound impact on the Earth's ecosystem. How much nature are we prepared to sacrifice to sustain our lifestyle? And does it matter? Are we living sustainably? What are the conservation challenges? This conference explores major challenges to contemporary issues and sustainable practices in the built environment. The several papers to be presented at this conference are expected to review the progress that has been made so far and to explore how progress might be measured in these areas.
Where our Energy comes from is a topic of importance for energy security, cost and environmental reasons. Rapid urbanisation has come with a catalogue of challenges such as the need for sustainable Urban Transportation, Affordable Housing and Waste Management. Papers to be delivered, as part of this conference, will also examine how these might be best addressed, in terms of evaluating options, their feasibility and viability. Most of the papers to be presented at this conference would cover the following key areas:

- Energy Efficiency and conservation
- Environmental Conservation
- Sustainable Facility Management
- Sustainable Building material development
- Building Information Modelling Management
- Smart Cities Development
- Urbanization and Urban Ecology Management
- Resilient Cities and Sustainable Housing Development

In summary, the contemporary issues and sustainable practice conference will essentially look at ethical issues, examine the choices ahead of us and the impact on societies world-wide.

I would like to thank the School of Environmental Technology, Federal University of Technology Minna for giving me the opportunity to deliver the key note speech at this conference.
Thank you once again and enjoy the conference paper presentations.

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Umaru Aliyu (2018). **OVERVIEW OF CHALLENGES OF SUSTAINABILITY.** Contemporary Issues and Sustainable Prac tices in the Built Environment.. School of Environmental Technology Conference, SETIC, 2018

INTELLIGENT BUILDINGS AND GREEN BUILDINGS – WHICH WAY FOR NIGERIA?

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Buildings in the 21st Century incorporate information and communication technology resulting in intelligent buildings and smart environments. Concern with global warming and ensuring the sustainability of the environment has resulted in green or sustainable or eco-friendly buildings. Many countries have established green building certification criteria such as BREEAM and LEED to determine the level of sustainability of buildings. This paper discusses intelligent and green buildings using a case study approach. A total of twelve buildings were studied from different parts of the world. The findings reveal that there is a merging of intelligent and green buildings. Professionals in the building industry have discovered that building intelligence can actually enhance building sustainability. As the way forward for Nigeria, the paper recommends the establishment of Nigerian green building assessment criteria, the utilisation of renewable sources of energy as total power source for buildings, government policy to encourage utilisation of local building materials and greater emphasis on teaching of green building design in schools of Architecture in Nigeria.

Key words: building, green, intelligent, smart, sustainable.

INTRODUCTION

The 21st Century is a world of information and communication technology and this technology affects all spheres of life including building technology. Buildings of today incorporate information and communication technology resulting in intelligent buildings and smart environments. The concern with global warming and ensuring sustainability of the environment has also affected the construction industry and resulted in green or sustainable or eco-friendly buildings. Are intelligent buildings and green buildings mutually exclusive? This paper discusses this issue and considers the way forward for Nigerian building designs.

Intelligent Buildings

An intelligent building is a building which contains an integrated network of information management systems which control services such as: Heating, Ventilation, Air-conditioning, Lighting, Security, Fire control, Lift control and Water supply (Albino, *et al.*,2015; Ghaffarianhoseini, *et al.*,2015; Peluffo,2015; The Congress of Intelligent Buildings, 2016).Since all these systems are powered by electricity, it is obvious that for such a building to perform efficiently, there must be an alternative source of power supply in case of failure from the main power source. Some intelligent buildings have two back–up power sources, for example, Willis Tower, Chicago; without power, an intelligent building cannot function. Building automation, smart environments and smart houses are terms that are used in connection with intelligent buildings therefore they are defined below:

Building automation – is a programmed computerized network of electronic devices that monitor and control various services in a building. A building that has one or two of these systems is described as partially automated. A building with many of the systems is fully automated and therefore an intelligent building (Alwaer, *et al.*,2013; Arup, 2013; Wang, 2009).

Smart Environments: are environments which are richly interwoven with sensors, actuators, display and computational elements, embedded in the everyday objects of our lives. Smart environments aim to satisfy the experience of individuals by replacing hazardous work, physical labour, and repetitive tasks with automated agents (Buckman, *et al.*, 2014).

Smart Houses - Any device in a house that uses electricity can be put on your home network and be activated at your command. This command could be by voice, remote control, tablet or smart phone. You can therefore command your lights to switch on or off, switch on your cooker, electric kettle, television, CD player, thermostat, and switch them off, all without moving from your chair. You can even do it from a distance from your house depending on how sophisticated your device is. You can monitor security in your house, confirm that your doors are locked, check who came to your house in your absence, and ensure that the police are notified if a burglar tries to break into your house in your absence (Arup, 2013; Jonstone, 2013; Preiser and Schramm, 2002).

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Several universities are developing smart houses that go far beyond the state of the art luxury market. Researchers at the Massachusetts Institute of Technology (MIT), Georgia Institute of Technology, and University of Colorado, among others, are experimenting with sensors, cameras, and monitors installed in experimental houses to learn more about the physical and social environment and the pattern and habits of the occupants.

Researchers are reaching for unobtrusive or pervasive computing where tiny devices are invisibly embedded in the house and seamlessly integrated with one another and the humans who benefit from them. They will fit in so naturally, be so intuitive and effortless, that people will no longer be aware that they are there. The information gathered on the habits and behaviour of the occupants of the house, is stored and analysed by a computer, which can then use it to help people with preventive health care, alert remote family members to changes in living patterns or remind an occupant on essential daily activities like taking medication or even feeding the fish (Alwaer, *et al.*,2013; Arup, 2013; The Congress of Intelligent Buildings, 2016).

Environmental Sustainability and the Built Environment

The growing concern about global warming and ensuring sustainability of the world around us has led to greater focus on green or sustainable or eco-friendly building construction (Jimoh and Banuso, 2008; Green Building, 2012; Zubairu, 2012; Dahiru, *et al.*,2014). Green buildings are defined below:

Green Buildings

Green buildings or sustainable buildings are buildings which are environmentally friendly, that is buildings which have minimal adverse effect on the environment, ensuring water and energy efficiency, utilising renewable sources of energy and as much of recycled and local building materials as possible (Brandon and Lombardi, 2011; Green Building Index [GBI], 2013).

This focus on environmental sustainability in the building construction sector has led to various organisations in different parts of the world producing methods of rating and assessing the sustainability of buildings.

Green Building Certification Methods

1.BREEAM – This was the first assessment method and emerged from the United Kingdom in 1990. BREEAM stands for Building Research Establishment Environmental Assessment Methodology. It was first published by the Building Research Establishment (BRE), a former United Kingdom government establishment that carried out research and consultancy for the construction and built environment sectors in the UK. It is the world's first known method of rating and assessing the sustainability of buildings.

The categories used by BREEAM for the assessment are: Management, Health and wellbeing, Transport, Water, Materials, Waste, Land use and ecology, and Pollution. BREEAM is used in more than 70 countries with several in Europe having gone a stage further to develop country-specific guidelines (BREEAM, 2017).

2.LEED CERTIFICATION -LEED stands for Leadership in Energy and Environmental Design. It is a green building certification programme that recognises best-in-class building strategies and practices (US Green Building Council,2017). To achieve LEED certification, building projects have to satisfy prerequisites and earn points to achieve different levels of certification. It was developed in 1998 by a non-profit body in the USA called the US Green Building Council (USGBC).

Certification Levels:

(i) Certified: 40 -49 points.
(ii) Silver: 50 – 59 points.
(iii) Gold: 60 -79 points.
(iv) Platinum: 80 points and above.

3.CASBEE- CASBEE stands for Comprehensive Assessment System for Built Environment Efficiency. CASBEE was developed by the Japanese Sustainable Building

Consortium (JSBC) in 2001. It has various criteria which are used to evaluate and rate the environmental performance of buildings and the built environment (CASBEE, 2017).

4.GREEN STAR –Green Star is a voluntary sustainability rating system for buildings in Australia. It was launched in 2003 by the Green Building Council of Australia. The system assesses the sustainability of projects at all stages of the built environment life cycle (Green Building Council of Australia, 2017).

METHODOLOGY

A case study approach was utilised in this paper. Studies were carried out into world renowned intelligent and green buildings. The major study was into the first skyscraper to obtain platinum LEED certification in the United States of America.The extent to which building intelligence affected or assisted in building sustainability was considered in the case studies to determine whether they are compatible in the design of buildings. A total of twelve buildings were studied from different parts of the world under the categories of intelligent, green and intelligent + green.

(i)Intelligent Building – Willis Tower (former Sears Tower), Chicago, USA (1974)
Architects- Skidmore, Owings and Merrill.
On completion in 1974, the Willis Tower (Plate 1) was the tallest building in the world. It is one of the early intelligent buildings with fully automated services. The building has two back-up generators in case of power failure from the power supply company as any loss in power would automatically shut down most operations in the building.

Plate 1 – Willis Tower, Chicago
Source: Emporis.com(2006)

(ii)Intelligent Building – The Ahwatukee House, Phoenix, Arizona, USA (1979)
The architect, Charles Robert Schiffner, had a vision of an automated home. He wanted to incorporate a sophisticated means of control of services and security in the home using information technology. He contacted the Motorola Technology Company to develop a home manager computer system for the building. The Ahwatukee House (Plate 2), was the first smart home and was described as the House of the Future. Tourists used to pay to visit the house and exclaim in wonder at the technology. Smarter homes have been designed since then but the Ahwatukee House was a trail blazer in the field of automated home design (Smith, 2009).

Plate 2: Ahwatukee House, Phoenix, Arizona
Source: Smith (2009)

(iii)Intelligent Building - Bahrain World Trade Center (2008)- Architect – Atkins
The building features advanced security systems and automation of services. The shape of the building channels airflow through three turbines that are 95 feet in diameter (see Plate 3). The turbines generate 11-15% of the building's energy needs (7 Intelligent Buildings, 2017).

Plate 3: Bahrain World Trade Center
Source: 7 Intelligent Buildings (2017)

(iv) Intelligent Building – Burj Khalifa, Dubai, United Arab Emirates (2010) – Architects – Skidmore, Owings and Merrill. This skyscraper is the tallest building in the world at 828 metres in height and 160 storeys (see Plate 4). The building has a total of 57 elevators and eight escalators. It has the world's tallest service elevator with a capacity of 3.500Kg (m.burjkhalifa.ae, 2017). The building has an intelligent lighting control system that is automated and flexible. The system is user friendly and delivers the appropriate lighting levels according to the time of the day.

Plate 4 – Burj Khalifa, Dubai, United Arab Emirates
Source: Facts & Figures| Burj Khalifa (2017)

(v)Intelligent Building – Al Bahr Tower, Abu Dhabi (2012)– Architect – Aedas
The building is clad with a unique dynamic shading system that reduces its solar gain by 50% (see Plates 5(a) and 5(b)). The shading system is computerised to adjust to changing weather conditions (7 Intelligent Buildings, 2017).

Plate 5(a): Al Bahr Towers, Abu Dhabi
Source: 7 Intelligent Buildings (2017)

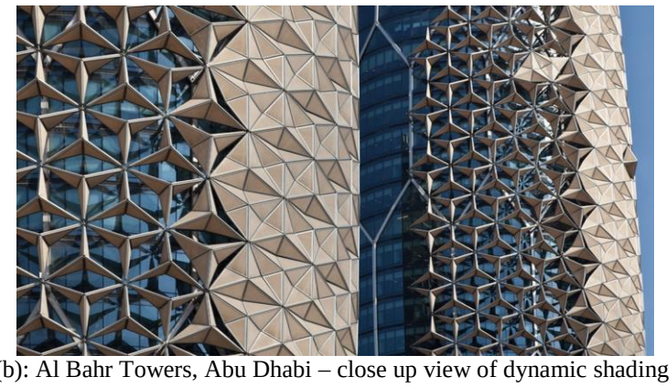

Plate 5(b): Al Bahr Towers, Abu Dhabi – close up view of dynamic shading system
Source: 7 Intelligent Buildings (2017)

(vi)Green Skyscraper – One Bryant Park – Bank of America Tower, New York, USA.
One Bryant Park, New York, is one of the greenest or most eco-friendly skyscrapers in the world (see Plate 6). The building was completed in 2010 and is the first skyscraper in North America to achieve LEED Platinum certification. The architect is Richard Cook of Cook + Fox; the building has 55 stories and is 365m in height. The initial cost of the building was about 5% higher than a normal skyscraper due to some of its sustainable features. However the building now reduces annual energy and water consumption by 50% (Cook + Fox Architects, 2011).

Plate 6 – One Bryant Park – Bank of America Tower, New York, USA.
Source: Cook + Fox Architects (2011)

The features which make the building environmentally advanced include the following:

1. Re-cycled steel was used for the framework of the building.
2. Blast furnace slag from the steel mill was used in the concrete mix for the building reducing the amount of cement used. It therefore emitted less carbon into the atmosphere during mixing of concrete and also produced stronger concrete.
3. Materials used for the construction of the building were obtained from sources as close to the building site as possible to reduce transportation costs.
4. Natural ventilation – the air that enters the building is passed through a state-of-the-art advanced air filtration system for exceptional indoor air quality.
5. Special glass was used for the facade that lets in light but deflects heat keeping the interior cooler. The interior of the building also has enough daylighting so use of artificial lighting is reduced during the day.
6. Green roof that utilises compost from tenant cafeteria waste; the green roof keeps the roof cool, absorbs carbon dioxide and emits oxygen.
7. Harvesting of rain water which is purified and used throughout the building.
8. There is an ice cooling system in the basement so water is stored in tanks then passed through the system and used for the air-conditioning when required (Cook + Fox Architects, 2011).

(vii)Green Building - The Bullit Center, Seattle, Washington, USA. Architects – Millner Hull Partnership
The Bullit Center is one of the greenest office buildings in the world (Plate 7). It has 575 solar panels on the roof that spread out like the canopy of a tree to generate electricity for the city of Seattle in summer months. It is designed to run essentially zero energy, water or waste.

Plate 7 – The Bullit Center, Seattle, Washington, USA
Source: https://www.archdaily.com

(viii)Green Building - Jacobs Institute for Design Innovation, Berkeley, California, USA.

Architects – Leddy Maytum Stacy. The Institute is devoted to introducing sustainable design innovation as the core of university life (see Plate 8). The building was designed as both a collaborative, project-based educational space and a symbol to the region of the university's commitment to sustainable innovation; it reduces energy use 90% below the national baseline.

Plate 8: Jacobs Institute for Design Innovation, Berkeley, California, USA.
Source: https://www.archdaily.com

(ix)Biosciences Research Building, Galway, Ireland. Architects – Payette and Reddy. The building was designed to utilise natural ventilation and is supplemented less than 10% of the year with radiant heating. 45% of the building is able to function without mechanical ventilation (see Plate 9).

Plate 9 :Biosciences Research Building, Galway, Ireland.
Source: https://www.archdaily.com

(x) Green Building – Heritage Place, Ikoyi, Lagos, Nigeria.
Architects – Capita Symonds, UK and ECAD, Nigeria – Heritage Place (see Plate 10) is the first commercial building in Nigeria to achieve LEED certification. It is a 14 storey building that promises 30 – 40% reduction in energy use compared to that of other buildings in Lagos. Green features in the building include water recycling and reuse, high efficiency lighting and building orientation to maximise natural light and ventilation (heritageplaceikoyi.com,2016).

Plate 10 – Heritage Place, Ikoyi, Lagos
Source: heritageplaceikoyi.com

(xi) Intelligent + Green – Taipei 101, Taipei, Taiwan. Architects – C. Y. Lee and Partners
Taipei 101 was the tallest building in the world from 2004 to 2010. It achieved LEED Platinum certification in 2011. The curtain walls of the building comprise of double-paned blue-green glass that is highly reflective and blocks solar gain by 50%. Other sustainable features include energy efficient light bulbs, low-flow water fixtures and a smart energy management and control system (skyscrapercenter.com, 2017).

Plate 11- Taipei 101, Taipei, Taiwan

Source: Skyscrapercenter.com

(xii)Intelligent + Green – The Duke Energy Center, Charlotte, North Carolina, USA Architect – tvs design.

The building has LEED Platinum certification (see Plate 12); it also features a building automation system by Siemens that integrates multiple platforms and protocols, running ten independent systems over one IP network.

Plate 12: The Duke Energy Center, Charlotte, North Carolina, USA
Source: https://www.archdaily.com

FINDINGS

There appears to be a merging of intelligent and green buildings. The focus in the 1980s up to 2000 had been on building intelligence. However, as greater awareness on environmental sustainability was heightened, architects started designing green buildings. Green building certification systems were established in developed countries and architects and developers strive to ensure that their buildings have high green certification. Building professional bodies in many countries around the world have established annual awards for greenest buildings. Professionals in the building industry have discovered that building intelligence can actually enhance building sustainability. The Willis Tower, Ahwatukee House and Burj Khalifa save energy by automatically switching off lights when sensors detect that a room is empty. In the Bahrain World Trade Center, apart from the building automation, the shape of the building channels air flow to three wind turbines that generate renewable energy for the building. The shading systems in the Al Bahr Tower, use building intelligence to adjust to changing weather conditions. One Bryant Park, which has numerous green features, also uses building intelligence to carry out the recycling of water in its water harvesting process. The Bullit Center, Jacobs Institute for Design Innovation, Biosciences Research Building, and Heritage Place, all green buildings, also use building automation to enhance the performance of the systems in the buildings. Granted that intelligent buildings require electricity to function, the integration of systems can actually result in greater energy efficiency and energy conservation in buildings (Continental Automated Buildings Association [CABA], 2008). For example, sensors can ensure that lights are automatically turned off if no one is in a room. Entry cards can be programmed that the staff member that uses his entry card after work will activate only the lights in his section of the building. Taipei 101 and the Duke Energy Center clearly embrace all the advantages of green design and building intelligence. They have the highest LEED certification (Platinum) and all the building automation systems of a highly intelligent building.

A building that encompasses all the attributes of green buildings and building intelligence has been described as a "bright green building"(Walker,2008).This is illustrated in Fig 1.

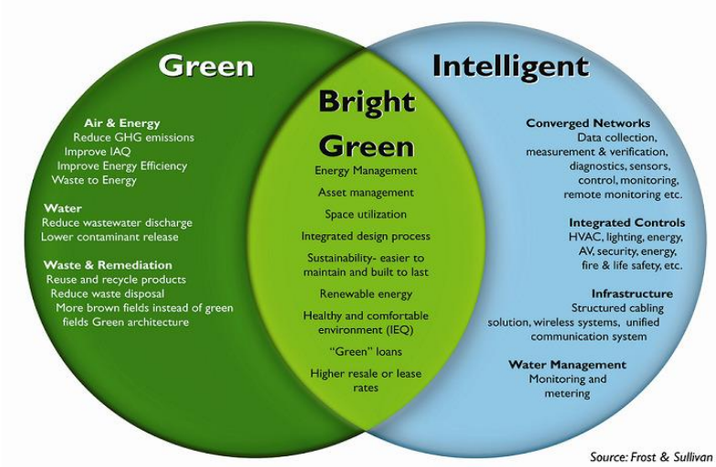

Fig. 1 – Convergence of Green and Intelligent buildings to form Bright Green Building
Source: Frost and Sullivan(2008)

There are clearly benefits to be derived from *bright green buildings.* The use of building automation to enhance building sustainability is a challenge for all architects.

The Way Forward for Nigeria
It is clear that Nigerian building professionals should focus on green building construction. The Federal government, professional bodies and educational institutions of higher learning all have roles to play to achieve this in Nigeria. These are highlighted below:

(a)Establishment of Nigerian Green Building Assessment Criteria -Most countries of the developed world have adopted a green building assessment method to ensure sustainability in the built environment. Professional bodies in these countries award prizes to buildings that obtain high certification points, making it a competition for architects, builders and developers to strive for recognition as leaders in the green building movement. The Nigerian Institute of Architects should make it a top priority to ensure the adaptation of one of these green building assessment methods to conform with our climate and culture. The Institute should also present annual prizes for the greenest buildings constructed in the country each year.

(b)Utilisation of Renewable Sources of Energy as total power source for buildings –
The problem to be solved by Nigerian architects and engineers is how to provide enough energy in a building to make building automation effective. As mentioned earlier, intelligent buildings require 24 hour power supply with back-up. Without this, it would be a chaotic scenario with total system failure. At present in Nigeria, power supply from the National Grid is totally inadequate. Architects need to work with electrical engineers and other building professionals to design buildings with renewable energy sources that will guarantee 24 hour power at a cost-effective rate totally independent of the National Grid if we are to achieve the dream of *bright green buildings* in Nigeria.

(c)Government policy – Policies to restrict importation of building materials, develop the local building material industry and encourage recycling of building materials, would be a major boost for green buildings in Nigeria. The Architects Registration Council of Nigeria (ARCON) and the registration councils of the other professional bodies should come together to produce a bill that would be presented to the National Assembly as a first step to establish such policies in Nigeria.

(d)Schools of Architecture in Nigeria to focus on Green Building Design – The curricula of the various schools of Architecture in Nigeria should be reviewed to incorporate a deliberate focus on green building design right from 200 level. The principles should be engrained into students right from an early age so that it becomes part of their thinking in any type of design project.

CONCLUSION

New discoveries in technology have made the design of buildings more challenging and innovative. The imagination of designers has to be constantly stimulated and broadened to keep track of changes in the environment and their effects on humans. The lack of expected advancement in development in various sectors in Nigeria should not discourage our building professionals. Let us see it as a challenge; we must devise means to overcome these shortcomings and join the developed world in the design of bright green buildings.

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SUSTAINABLE COST MANAGEMENT

FACTORS RESPONSIBLE FOR VARIATION IN COST OF MECHANICAL AND ELECTRICAL SERVICES IN BUILDING PROJECTS IN NIGERIA

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Cost is the primary factor that determines the success and failure of a construction project and must be considered as the paramount and driving tool in order to have a successful project. Cost variation is a very frequent term associated with Mechanical and Electrical (M & E) service in construction projects. Maintenance cost projection for M & E services had been an issue of serious concern to both Client and Project contractors. In view of this, The aim of the research is to determine factors responsible for variation in cost of M & E services in building project in Nigeria with the following objectives: to identify the factors responsible for variation in cost of M & E services and to proffers possible recommendation. To achieve these objectives, the study designed a structured questionnaire containing 52 cost variation factors which were distributed among the construction firms registered with Federation of Construction Industry (FOCI). Data were analyzed using mean item score (MIS) and simple percentages. It was analytically discovered that factors such as inadequate planning: fraudulent practices, kick back and corruption; incessant variation order; change in Project design are the most important (Critical) factors responsible for variation in cost of M & E services. It was recommended that adequate planning should be made at both design and construction stage; variation must be reduced to barest minimal; design should be finalized before construction can commence and ensuring that proper methods of cost estimations were used.

Key words: *Electrical services; Mechanical services; Nigeria; Variation; Building Projects*

INTRODUCTION

Building services are very vital in Construction Industries and accounts to 40% of construction cost. Regrettably, developers in this sector have not given enough attention to the way cost is managed and most of these developers do not also pay attention to the process of procuring Mechanical and Electrical services. The reason has been tied to the fact that the lump sum has been used when preparing the bill of quantity (BOQ). Yusuf and Mohamad (2012 noted that this has resulted in a condition where it becomes difficult to determine a dependable cost information from earlier projects. Building services in Nigeria is very complex to understand, calculate, schedule, coordinate and design. As selection, design, installation and coordination of mechanical and electrical system are poor, this will result in significant problems for Designers, Engineers, Contractors and Clients during and after execution. Trained project managers in high capacity are important for the successful execution of mechanical and electrical projects. Mechanical and Electrical Engineering Services Systems in Buildings comprises all engineering systems associated with building other than civil and structural engineering works. It is therefore imperative to have an accurate estimate for the cost of M & E service at the early stage of project.

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Accuracy will give both the clients, contractors and even consultants an insight on how to include the issue of variation in the percentage allocation of building services from initial stage, in order to eliminate the problem of future project abandonment, dispute among the members of construction team and loss of client confidence in consultants among the other benefits. It is on this background that, the purpose of this research work is to determine factors responsible for variation in cost of M & E services in building projects in Nigeria.

LITERATURE REVIEW

Cost overrun

Cost has been described as important prime factor for project success. Some of the importance factors that affect cost are qualitative in nature (Elchaig, Boussabinaine and Ballal, 2005). Cost overrun can be defined as when the initial estimate of the project is exceeded (Avots, 1983). Variation in construction work cannot be avoided and it has effect on labour productivity. A complete project may not be regarded as successful project until and unless it is finished within the cost limit. (Rizwan and Azhar, 2008). It is believed that the construction project experience an increase in cost of about 33% on average (Hartley and Okamoto, 1997). According to Flyubjerg, Holm and Buhl, (2002) for every 10 project executed 9 of them had overrun, over 50-100% were common and overrun had been constant for period of 70 years for which data were available. In developing countries Nigeria in particular, cost overrun is severe which sometime goes above 100% of the total construction cost. Wakjira (2011) opined that Building owner discovered five reasons for project cost overruns. These reasons were (1) incomplete drawings; (2) poor pre-planning process; (3) escalating of materials; (4) lack of timely decisions; (5) excessive variation orders.

Importance of Cost Overrun

Serag, Oloufa, Malone, Radwan (2010) stated that variation orders are very common in almost every construction project nowadays which resulting to increases of 5 – 10% in the contract price and that encountered an increase in the price from 1% to 15%, Eleven variables were analyzed to test their impact on the cost of variation orders. The study concluded that most significant variables that impact the value of variation order, which are: (1) Timing of variation order and (2) when the reason for issuing variation order is unforeseen conditions. The need to make variation on a construction project may necessitate variations due to various factors. The variations can be minimized when problem is studied collectively as early as possible, since the problems can be beneficial, variation can be made. Project management teams must have the ability to recognised potential effect of variations in order to minimize their adverse impacts to the project. Hanna and Swanson, (2007) suggested some strategies that both the client and the contractor can undertake whenever there are variation which have cumulative impact on the project to reduce disputes.

Effect of Cost Overrun

Osman, Omran, and Foo, (2009) pointed out most frequent effect of variations were (1) Increase in project cost; (2) Rework and demolition; (3) Completion schedule delay; (4)) Increase in over head expenses; (5) Additional payment for contractor. Arian and Low, (2005) the occurrence of variation orders has indirect cost implications. Direct cost constitutes the additional cost incurred to perform the activities of the current variation orders. The direct cost associated with variation orders include the following (1) cost of resources that were used to carry out the aborted or substituted work; (2) Resources used including Labour, Material and Plant to carry out the actual variation order; (3) increase in over heads related charges and professional fees; (4) Demolition cost of aborted works; (5) cost for resources lying idle before the ordered task restarts; (6) Loss of productivity due to interruption of works where the gang has to familiarize with new working conditions tools and materials; (7) plant hire and paid time for labour loitering around while waiting for instruction; (8) cost for redesign and administration of variation order.

Impact of M/E Systems on Construction Cost

Richard and William (2005), asserted that the impact of M/E system on construction cost varies greatly depending on the type of building standard of living of the country, Architectural design and M/E systems selected. The range of M/E system cost in the United States for fully air-conditioned and high-quality buildings is given in Table 2.1. These values may serve as a general reference for modifying and refining the cost throughout the design process.

TABLE 2.1: Range of M/E Systems Cost of Building Cost

	Percent of total Building cost		
Type of Occupancy	Low	Medium	High
Computer centres	30	45	60
Department stores	20	25	30
Hospitals (Research)	30	40	50
Hospital (Clinical)	25	30	35
Hotels (Residence)	20	30	35
Hotel (Convention)	25	35	40
Office (General)	20	25	35
Office (high-tech)	25	35	45
Research laboratories	30	40	50
Residential, Single-occupancy	10	15	20
Residential high-rise	15	20	25
Retail, individual stores	10	20	25
Retail (Department)	20	25	30
Schools, elementary	15	20	30
School, secondary	15	25	35
Universities and colleges	20	30	40

Source: Richard and William (2005)

Hall and Greeno (2003) have noted that engineering services in a building provide an environmental health and comfortability which allow people to carry on their activities without physiological stress or constituting nuisance. Hall and Greeno (2003) Generalized services as provision of mechanical and electrical services in a building. The goodness of engineering services has increased as the standard for internal building environment are varied and also as more measures are taken. According to Morenikeji (2006) a house should not be regarded as a home if it does not guarantee the minimum require privacy, protection and essential facilities. Housing goals and objectives can be perceived as the extent to which the quality and quantity of existing services are required for each house hold.

Factors Responsible for Cost Variation in Services

Research as showed that construction projects encountered an average of 33% increase in cost (Hartley and Okamoto, 1997). Angelo and Reina (2002), pointed out that it is important to know problems of cost overrun and learn more how to improve on these problems in future They also pointed out that cost overruns are major challenges in both developed and developing countries. The trend causes more problems in developing countries where this overrun goes beyond 100% of the anticipated cost of the project. Substandard materials lead to increase in construction cost than the expected because of the loss of material during the implementation phase. This resulted from lack of standards for materials and management systems (Arain and low,2004). Inability to control construction costs, lead many construction companies not to succeed (Scriprasert, 2000). According to User's Guide (2005), the following are the factors that change the cost of the construction projects through time: (1) Poor project management; (2) Design changes; (3) Unexpected ground conditions; (4) Inflation; (5) Shortages of materials; (6) Change in exchange rates; (7) Inappropriate contractors; (8) Funding problems; and (9) Force majeure. Elinwa and Buba (1993), stated that cost of materials, fraudulent practices and kickbacks, and fluctuation of prices of materials are three of the most important factors, among other factors, leading to high construction costs in Nigeria. Analyses of results leading to high construction costs show excellent agreement between the responses of the professionals (architects, engineers, and quantity surveyors) and the results of past researchers Flyvbjerg *et al* (2002) and Molenaar (2005), in developing countries, the lack of proper phasing of construction projects and lack of proper planning can contribute to the discrepancy of supply and demand. This leads to shortage of construction materials as the demand will exceed the supply, which in turn leads to an increase in the cost of construction materials; this inevitably gives rise to project cost overruns, Alnuaimi et al. (2010), discovered that for every seven out of eight of building contractors surveyed in the late 1960s in Australia, were completed after scheduled completion, while according to Oman delay affect 70% of the project and executed above initial cost. Ogunsemi and Jagboro (2006) stated that the overrun can be cause by wrong cost estimation method adopted at the early stage of building projects. Remon (2012), discovered that factors such as: lowest bidding procurement method; additional work; bureaucracy in bidding/tendering method; wrong method of cost estimation; and funding problems were critical factors responsible for causing cost variation for constructing waste water project, while Inaccurate cost estimation; mode of financing and payment for completed work; unexpected ground conditions; inflation and fluctuation in prices of raw materials are also responsible.

However these research works does not determined factors responsible for variation in cost for M & E services in building projects in Nigeria, hence this study filled the gap by determining factors responsible for variation in cost for M & E services in building projects in Nigeria with the following set objectives: to identify the factors responsible for variation in cost of M & E services and to proffers possible recommendations.

METHODOLOGY

This study short-listed 52 factors responsible for variation in cost for M & E services in building projects in Nigeria. The research work involved the use of qualitative approach. This study employed primary source of data collection. The primary data are obtained from administration of structured questionnaire. Out of 50 questionnaires administered, 35 were returned and 5 were not filled properly, basically 30 were found useful for this research work. The study employed the use of descriptive statistic (MIS and percentage) to analyze the data collected.

The population of this study constitutes the number of construction firms in Abuja registered with Federation of Construction Industry in Nigeria (FOCI) from where sample were drawn. FOCI have 84 registered construction firms in Nigeria, out of which 50 operate in Abuja.

These are methods of organizing, summarizing and presenting data where no tests conducted. The use of tables and bar charts were employed to present collected data. The data collected from the questionnaires were analyzed through the use of mean item score in order to rank the factors responsible for variation in cost of M & E services in building projects in order of importance.

Mean item score thereafter was used to rank the degree of important of these factors responsible for variation in cost of M & E Services based on a 5- point Liker's scale. The decision rule used for the 5- point ranking is summarized in Table 1.

Table 1: Decision Rule for Mean Ranking

Rank	Cut-off Point	Decision
5	4.50 - 5.00	Most Important
4	3.50 - 4.49	Very Important
3	2.50 - 3.49	Fairly Important
2	1.50 - 2.49	Less Important
1	1.00 - 1.49	Not Important

Source: Morenikeji (2006)

RESULTS AND DISCUSSION

Demographic Information of Respondents

Table 2 shows that respondents that are males accounts for the higher percentages of 80% with a count of responses from respondents as 24 whilst the respondents that are females accounts for the smallest amount of responses counts of 6, accounting for 20%. This implies that majority of respondents are male.

Table 2: Gender of Respondents

Gender of the Respondent	Frequency	Percent
Male	24	80
Female	6	20
Total	**30**	**100.0**

Source: Author's Field study, (2016)

Table 3 shows that respondents that are 25–35 years of age accounts for the higher percentages of 50% with a count of responses from respondents as 15 followed by 36-45 years which account for 33.3% with a count of responses from respondents as 10 and finally, the respondents that are 46-55 years accounts for the smallest amount of responses a counts of 5, accounting for 16.7%. while the remaining two categories, Less than 25years and above 55years had no respondents. This implies that majority of respondents are 25-35years of age.

Table 3: Age of Respondents

Age of the Respondent	Frequency	Percent
Less than 25 years	0	0
25 – 35years	15	50
36 – 45years	10	33.3
46 – 55years	5	
Above 55years	0	16.7
		0
Total	**30**	**100.0**

Source: Author's Field study, (2016)

Table 4 shows that respondents that are contractors and consultants possess equal percentages of 50% each, possessing a count of responses of 15 whilst those that are clients possess Zero percent with a response count of 0. This implies that both Contractors and Consultants possess the most percentages.

Table 4: Type of Organization of the Respondents

Type of organization	Frequency	Percent
Contractor	15	50
Consultant	15	50
Client	0	0
Total	**30**	**100.0**

Source: Author's Field study, (2016)

Table 5 summarizes the Designations in the Construction Industry. The table indicates that the respondents that are in Quantity Surveying possess the most highest percent of 36.7% possessing a count of responses of 11 accompanied by respondents that are in Building and Architecture possessing a count of responses of 7 giving 23.3% each. The respondent which are engaged in Engineering have a response count of 5 with 16.7% each. However, the respondents that are others have response count of zero (0). This implies that Quantity Surveyors are the major respondents for the study followed by Architects and Builders and finally, those that are Engineers.

Table 5: Designation of Respondents

Designation of the Respondent	Frequency	Percent
Architects	7	23.3
Builders	7	23.3
Engineers	5	16.7
Quantity Surveyors	11	36.7
Others	0	0
Total	**30**	**100.0**

Source: Author's Field study, (2016)

Table 6 contains fifty-two factors that are ranked using mean item score in order to establish the most important factors causing variation in the cost of M & E services in Nigeria.

Table 6 Mean Item Scores

S/NO	FACTORS	MEAN SCORE	RANK	REMARK
1	In adequate planning	4.40	1st	Most Important
2	Fraudulent practices, kickbacks and corruption	4.17	2nd	Most Important
3	Incessant variation order	4.17	2nd	Most Important
4	Change in project design	4.13	4th	Most Important
5	In accurate cost estimation	3.83	5th	Very Important
6	Inadequate site investigation	3.83	5th	Very Important
7	Wrong method of cost estimation	3.80	7th	Very Important
8	Project complexity	3.77	8th	Very Important
9	Stealing and waste of material on site	3.77	8th	Very Important
10	Additional works	3.73	10th	Very Important
11	Scope changes arising from redesign and extensive variation occasioned by change in brief	3.73	10th	Very Important
12	Fluctuation in prices of raw materials	3.70	12th	Very Important
13	In appropriate preconstruction study	3.63	13th	Very Important
14	Inflation	3.60	14th	Very Important
15	Dispute on site	3.53	15th	Very Important
16	Scope changes occasioned by inadequate pre-contract study	3.53	15th	Very Important

17	1n appropriate contractors	3.53	15th	Very Important
18	Work suspension owing to conflict	3.47	18th	Fairly Important
19	Unexpected ground condition	3.47	18th	Fairly Important
20	High cost of machineries,	3.43	20th	Fairly Important
21	Poor contract management	3.43	20th	Fairly Important
22	Bureaucracy in bidding/tendering method	3.43	20th	Fairly Important
23	Litigation	3.43	20th	Fairly Important
24	In appropriate contractor's policies	3.43	20th	Fairly Important
25	High interest rates charged by bankers on loansreceived by contractors	3.40	25th	Fairly Important
26	Poor financial control on site	3.40	25th	Fairly Important
27	Inadequate quality/ambiguity of contract documents	3.40	25th	Fairly Important
28	Poor project (site) management/poor cost control	3.40	25th	Fairly Important
29	Force majeure	3.40	25th	Fairly Important
30	Lack of coordination between design team and general Contractor	3.30	30th	Fairly Important
31	Lowest bidding procurement method	3.27	31st	Fairly Important
32	High machines maintenance cost	3.23	32nd	Fairly Important
33	In adequate labour/skill availability	3.23	32nd	Fairly Important
34	Shortage of materials and plants	3.23	32nd	Fairly Important
35	Unstable cost of manufacture materials.	3.20	35th	Fairly Important
36	Inadequate production of raw material in the country	3.20	35th	Fairly Important
37	Adverse effect of weather	3.20	35th	Fairly Important
38	High transportation cost	3.17	38th	Fairly Important
39	Funding problems.	3.17	38th	Fairly Important
40	In appropriate government policies	3.13	40th	Fairly Important
41	In appropriate contractual procedure	3.10	41st	Fairly Important
42	Absence of construction cost data	3.03	42nd	Fairly Important
43	Poor relationship between manager and Labour	3.00	43rd	Fairly Important
44	Shortening in project period	2.97	44th	Fairly Important
45	Domination of construction industry by foreign firms and aids	2.97	44th	Fairly Important
46	Lack of coordination between general contractors and Subcontractors	2.90	46th	Fairly Important
47	Mode of financing and payment for completed work	2.87	47th	Fairly Important
48	High cost of skilled labours	2.87	47th	Fairly Important
49	Long period between design and time of bidding/tendering	2.83	49th	Fairly Important
50	Conflict between design consultants and implementation consultants	2.83	49th	Fairly Important
51	Numerous construction activities going on at the same time	2.57	51st	Fairly Important
52	Land acquisition cost	2.57	51st	Fairly Important

Source: Author's Field study, (2016)

CONCLUSION AND RECOMMENDATION

Conclusion

The study concluded that inadequate planning, Fraudulent Practices, Kick back and Corruption, Incessant Variation order and change in project design are most important factors responsible for variation in cost of M & E services in building projects in Nigeria.

Recommendation

In view of research findings and conclusions of the study the following recommending are made:

1. Adequate planning should be made by breaking the project planning into short term, medium and long term planning at both design and construction stage; adequate supervision.
2. Variation must be reduced to the barest minimal; designs should be finalized before construction can commences; the cost estimator should be aware of problems and must use all data and time available to produce the best possible estimate; adequate site investigation; materials should be purchase in bulk.

3. Establishing a system that will check fraudulent of individual accountability to discourage stealing and other criminal activities; keeping in view trends of inflation and depreciation factors.

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IMPACT OF CONTRACTUAL CLAIMS ON PUBLIC BUILDING PROJECTS PERFORMANCE IN ABUJA, NIGERIA

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Building construction projects in Nigerian are characterized by contractual claims, which remain a challenge in terms of time and cost performance, thereby triggering the need for effective contractual claims management in the building construction industry. The study is aimed at assessing the impact of contractual claims on the performance of public building projects with the view to devising strategies for effective management of contractual claims in public building construction projects. A pro forma was used to collect data on the impact of contractual claims while a structured questionnaire was used to gather information on the strategies for managing contractual claims. A random sampling of 122 respondents was done in Abuja, with a response rate of 86 percent. The obtained data were analysed using paired sample t-test, mean item score, correlation and explorative factor analysis. The study concluded that contractual claims have impact on cost and time performance, and a significant cost and time difference was experienced. An average cost increase of 16.68% was experienced in all the projects and the time increase was between 31% - 866%. To avert these problems, the study developed that effective communication, coordination and utilization of resources should be observed. It recommends that all the parties to the contract should ensure effective communication, coordination and utilization of resources in order to avert the problems of cost-time performance in public projects.

Keyword: *Contractual claims, Cost performance, Projects performance, Public buildings, Time performance.*

INTRODUCTION

Construction industry is the sector of the Nigerian economy that engages in preparations of lands, construction of buildings and facilities (Olufemi, 2013). The industry is almost seen as the backbone of every other sector as it accounts for about 15% of the national product of most developing countries and offers the motivating force essential for supporting financial buoyancy (Alintah-Abel and Nnadi, 2015). The industry adds an average of 5% to the yearly gross domestic product and an average of about 1/3 (one-third) of the overall fixed capital investment (Omole, 2000). Construction activities dictate the route of an economy and the industry is described as a leading economic sector (Alintah-Abel and Nnadi, 2015). There by calling for proper utilization and management of the industry.

Construction projects are set of tasks, embarked upon to make a facility, within a well-defined scope, quality, schedules and estimates. However, in some construction projects, claims are encountered which may be in the form of variation, delay in completion time, fluctuation or poor workmanship upon completion (Yadeta, 2014). Building construction projects experience claims sometimes, which occur before or after the contract is signed and they are inescapable in a building construction(s) projects (Ibbs et al., 2001). Construction claims are considered as the source of disruptions and unpleasing events by project participants in the construction industry (Ho and Liu, 2004). Contractual Claims requires defined clarifications of all that make up a construction contract, from the scope, to what constitutes disruptions and allowable delays.

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Saidu & Oyewobi (2018). **IMPACT OF CONTRACTUAL CLAIMS ON THE PERFORMANCE OF PUBLIC BUILDING PROJECTS IN NIGERIA.** Contemporary Issues and Sustainable Practices in the Built Environment. School of Environmental Technology Conference, SETIC, 2018

Completing a requisite project does not mean it is successful, but completing it within schedule, estimate and meeting the standard technically (Ivory Research, 2016). Successful projects are projects the client gets his anticipated values; which entail that the work is completed within schedule, estimate and quality as predicted at the planning stage of the project (Odediran and Windapo, 2014). Project performance, according to Cheung et al. (2004) requires the use of large number of indicators for measuring and evaluating the various dimensions of performance such as time and cost.

Contractual claim is a common problem in building and civil engineering construction projects (Yadeta 2014). Contractual claim on construction project has negative attributes to projects due to delay and disputes that sometimes generation of significant costs are effects arising during construction of projects. This negative attributes have brought about loss of client confidence in consultants, added investment risks, inability to deliver value to clients, and disinvestment in the construction industry (Eshofonie, 2008). Its presence on building projects has the potential to affect their performance.

Several studies had been conducted on the causes of claims, impacts of variation and claims management processes. However, there exists a gap on evolving strategies for managing contractual claims in the building industry. Thus, this paper is aimed at assessing the impact of contractual claims on the performance of public building projects, with a view to evolving strategies for effective management of contractual claims. Through establishing the effects of contractual claims on the performance of public project and to establish the strategies for managing contractual claims for better project performance in Nigeria.

LITERATURE REVIEW

Claims in Building Construction Contract

Claims on construction projects involve the stakeholders and is of key importance to make arrangement for uncertainties that may risk construction project. Each project has uncertainty linked with it; the degree of the particular risk will manifest itself on a given time in the project (Shapiro, 2007). Both the contractors and client know that claims cannot be avoided or solved easily as claims arise as a result of risk not well managed in construction project but when these risk are identified early and managed by appropriate methods, it will at least be controlled within some allowable range to avoid contractual claims (Nguyen, 2014). The most common type of contractual claims arises from express terms of a contract (Simon et al., 2007). Contractual claim may include any or all of the following: variation, fluctuation, loss and expense and extension of time (Simon et al., 2007; Reg, 2001). Nothing is more constant than contractual claim during the course of a construction project, despite the best efforts of all participants during the planning, implementation and administration of the contract, claims will almost certainly occur and can be damaging to any project, if not considered collectively by all the stakeholders involved in the construction projects (Arain and Pheng, 2005). Sunday (2010) asserts that the complexity of the construction industry due to different stakeholders' involvement makes it differ from other industries. This complexity gives rise mostly to unwanted situation like contractual claim with their attached effects, and the more the claims on a project, the greater the likelihood that they become time consuming and costly in construction projects (Mohamed, 2001). In building construction projects, claims may be initiated either by the contractor or the client, which are entitled to payment for work including any loss incurred by either party at the course of carrying out the project and may also be entitled to claim for additional time and or money (Murdoch and Hughes 2008). Contractors' claims may be described as requests for the reimbursement for additional costs resulting from certain employer or employer's agent's acts, which delay or disrupt the contractors progress, and which otherwise would not be recoverable under the contract (Cunningham, 2014). Though typical construction projects are not only contractual but complex and lengthy in nature, given these variables, emanating issues give rise to disputes amongst parties (Ojo, 2013). When commencing construction, contractors justifiably expect that all necessary project documents are not only correct but in place, adequate and received timely (Bryan, 2005), but in real sense, they are not actually so. Hence, Glover (2007) opined that due to the characteristics of construction project and environment, disruptions do occur; which warrant contractors to request for reimbursements.

Construction Project Performance

The goal of any project is greatly influenced by success rate of performance. It is seen as "the degree of attaining certain undertakings" (Project Management Institute 2004). It relates with approved bounds objectives which forms the projects bound (Chitkara 2005). From the project management perception, it is about satisfying the requirements of the clients and the prospects of a project. Construction works are consistently unchanged, placing it consideration on core component of time, cost and quality (Cheung et al., 2004). Yates and Eskander (2002) view a successful work as the work being completed without delay, within estimate, scope and quality. Thomas et al. (2002), Naoum, et al. (2004), Josephson and Lindstrom (2007), identified several means for measuring project performance, many of which were directed towards cost, time and quality. Ling (2004) asserted that the performance of a construction work is multi-tasking which may include cost per unit, speed in construction and delivery and satisfying client need.

Strategies for Managing Contractual Claims for Better Project Performance

The success of managing any construction project cannot be economically attained forcefully, but requires the creation of environments that will inspire self-motivation and brings in play team spirit that is significant to effective project executions. Since construction sites are viewed as important arena that cash are raised or loss and is a place where significant opportunity for cultivating efficiency, productivity and quality (Jimoh, 2012). According to Yang et al. (2002), if only project stakeholders' inputs, project characteristics, procurement system and other factors affecting performance can be carefully assessed and addressed during planning and implementation phase, these would lead to better productivity output which will in turn lead to timely completion, standard and minimized project cost. Also Sharafadeen et al. (2015) opined that project performance can be enhanced through the observation of the following: adequate and proper communication among parties involved in the contract, good contract management, good owner's financing capacity for the payment of completed works, and avoidance of design modifications during construction and further observed that enough materials should be procured for the timely completion of the project, adequate provision of funds by building owners to consultants and contractor during construction, delays in contractor's payment by owner should be avoided, avoid changes of design during construction and finally, identified that partial payments during construction should be avoided, adequate use of building professionals during construction and contractual management. Obiegbu (2012) opined that the following areas have to be taken very seriously in the management of construction project, if better performance is to be attained; project documents should be interpreted appropriately, the projects scope should be clearly understood, allocation of resources should be clearly done, provision of functional site layout should be ensured, implementation of the project should be planned and scheduled, having in mind quality control measures, statutory regulations should be complied with, corrective measures should be ensured in monitoring and controlling construction, processes, and engagement of well experienced professionals with well-defined roles. Maina (2012) also asserted that the type of construction contract agreed upon during procurement is to a large extend impacting on project performance and went further comparing the traditional type of contract and integrated contract, which shows that integrated contract enhances better project performance in terms of risk control, cost and time overrun which are the most important variables of the stakeholders.

RESEARCH METHODOLOGY

The study is based on government owned public building projects executed in Abuja, Nigeria from period of 2006 to 2016. Abuja houses several parastatals and agencies, with FCDA central to the development of public buildings. The public buildings considered were those executed by the Public Building Department of FCDA. A total of 120 building projects were identified, a pro forma was used for collecting the data on project cost and time, and a purposive sampling was used in selecting 44 building projects that their claims were ascertained and agreed. While the strategies for managing contractual claims were identified through extensive review of literature which was later developed into questionnaire which was self-administered to 122 respondents which includes clients, consultants and contractors. These 122 respondents were sampled from 97 registered Quantity Surveying

firms registered with the Nigerian Institutes of Quantity Surveyors, Abuja Chapter and 51 client's Quantity Surveyors, in the Public Building Department of FCDA. Krejcie and Morgan (1970) table was used to obtain the sample size. The developed structured questionnaire consisted of two parts; part one contained demographic questions; part two was on contractual claims management strategies. The questionnaire was rated on a five-point Likert scale ranging from strongly disagree (1) to strongly agree (5). The data was analysed using: Mean Item Score, spearman's correlation, Paired sample t-test and explorative factor analysis. Out of the 122 questionnaires administered, 105 (86%) were returned and fit for analysis. Mean Item Score was used to rank the identified strategies for contractual claims management, spearman's correlation show the degree of agreement between the clients, consultant and contractors group in terms of their views to the study factors. Paired sample t-test was used to test the significance difference between the final and initial cost – time and explorative factor analysis was carried out to explore the overall data and determine the factors and clusters of factors measured by the questionnaire.

DATA ANALYSIS AND DISCUSSION

Table 1 presents the demographic data of the respondents. 56% were members of the Nigerian institutes of quantity surveyors, while 44% were probationer members of the Nigerian institutes of quantity surveyors. And the respondents' background presents the following results: project Q/S 24%, project managers 33%, construction managers 10% and supervisors 33%. While working experience of respondents presents 32% of respondents to less than 5 years' experience, 44% were having 5-10 years' experience and 24% were having 10 years' experience and above.

Table 1: General Demographic Characteristic of Respondent

Characteristic	Frequency	Percentage (%)
Professional Qualification		
Fellow	0	0
Member	59	56
Probationer	46	44
Background		
Project Q/S	25	24
Project Manager	35	33
Construction Manager	10	10
Supervisors	35	33
Experience		
Less than 5 years	34	32
5-10 years	46	44
10 years and above	25	24

Source: Researchers Analysis (2017)

Cost Performance on Public Building

Table 2 presents the result of a paired sample t-test conducted to measure the significant difference in the final cost and initial estimate of the public buildings. The output gave an average mean of 157,856,936.00 with t-value of 2.754 and p-value of 0.03 at 95% confidence level. The p-value shows that there is significant difference between the final construction cost and initial estimate. The Effects Size, eta-squared represent the proportion variance of the dependent variable (final cost) that is explained by the independent variable (initial estimate) was calculated at 0.60. Indicates a large effect size, as it is above the 0.14 bench mark suggested by (Cohen 1998). This means that a large proportion of the variance of the final cost is predictable from the knowledge of the initial estimate.

Table2: Paired Sample T-Test for Cost of Claims on Public Buildings.

			Paired Samples Test							
			Paired Differences							
		Mean	Average Mean	Std. Deviation	Std. Error Mean	95% Confidence Interval of the Difference		t	df	Sig. (2-tailed)
						Lower	Upper			
Pair 1	final cost	1105719056	157856935	151657016	57320964.36	17597588	298116283	2.754	6	0.033
	Initial cost	947862120								

Further analysis in Table 3 shows 44 completed building projects, all experienced cost overrun ranging from 14% - 22%. On the average all the projects experienced cost deviation of 16.68%. The study of Omoregie and Radford (2006) established a cost increase of 14%,

which falls within the study result. Memon et al. (2012) carried out a study in Malaysia and discovered an increase of 5 -10%, while Flyvbjerg (2002) carried out a study on cost overrun on global construction and found that 9 out of 10 projects had cost overrun of 50% - 100%. This shows that project overrunning it initial estimate is not only peculiar to the Nigerian construction industry, but the world at large. The National Institute of Building Science (2013) gave a deviation acceptable range of 2-3%. This implies that more need to be done in managing cost overrun on public projects.

Table 3 Project Cost

S/N	Ref.	Project Tittle	Initial Contract Sum	Final Contract Sum	% Increase
1	4	Model Office complex	55,632,336.23	64,416,389.32	16%
2	5	Advanced E-Learning Centre	1,303,301,846.21	1,509,086,348.24	16%
3	6	library complex + offices	2,610,811,446.81	3,023,044,833.15	16%
4	8	female hostel	320,000,000.00	365,000,000.00	14%
5	10	Wasa Resettlement FCT. Lot D69 and A9.	64,152,441.15	77,953,075.36	22%
6	11	Residence of the speaker house of representative	924,701,193.16	1,064,014,331.47	15%
7	12 to 49	Mass Housing Resettlement projects FCT. (prototype)	1,356,435,579.14	1,636,518,417.10	21%

Source: Public building department.

Time Performance on Public Building

Table 4 present the result of a paired sample t-test conducted to measure the significant difference in the final time and initial time of the public buildings. The output gave an average mean of 42.86 with t-value at 2.67 and p-value at 0.03 at 95% confidence level. The p-value shows that there is significant difference between the final construction time and initial estimated time. The Effects Size, eta-squared was calculated at 0.59. It indicates a large effect size, as it is above the 0.14 bench mark suggested by (cohen 1998). This means that a large proportion of the variance of the final cost is predictable from the knowledge of the initial estimate..

Table4: Paired Sample T-Test for Time of Claims on Public Buildings.

Paired Samples Test

		Paired Differences							
					95% Confidence Interval of the Difference				
		Mean	Average Mean	Std. Deviation	Std. Error Mean	Lower	Upper	t	Df	Sig.
Pair 1	Final time	71.7143	42.85714	42.44380	16.04225	3.60317	82.11111	2.672	6	.037
	Initial time	28.8571								

(2-tailed

Further analysis in Table 5 shows that 44 completed building projects, all experienced time overrun ranging between 30% - 866%. This agrees with the study of Aghimiem and Awodele (2017) who posited in their study that projects in Nigeria may experience time overrun in the range between 17% and 860%. Omoregie and Radford (2006) established that time performance in the construction industry is very challenging; due to projects not completed as scheduled and observed that time overrun is on the increase. Adeyinka and Yusif (1997) observed 58% time overrun and 9 years later reported an increase of 188%. Nigeria and the world at large experiences projects being completed after schedule (Ogunsemi 2015).

Table 5: Project Time

S/N	Ref.	Project Tittle	Project Duration	Commencement. Date	Completion Date	% Completion	Extension of Time	% of Delay
1	4	Model Office complex	12 months	May. 2011	May. 2013	100	12 months	100%
2	5	Advanced E-Learning Centre	3 years	Dec. 2010	Nov. 2014	100	11 months	30%
3	6	library complex + offices	3.5 years	Feb. 2010	May. 2015	100	29 months	69%
4	8	female hostel	52 weeks	May. 2015	Dec. 2016	100	28 weeks	53%
5	10	Wasa Resettlement FCT. Lot D69 and A9.	12 weeks	Jun. 2011	May, 2015	100	104 weeks	866%
6	11	Residence of the speaker house of representative	3 years	2010	2014	100	12 months	33%
7	12 to 49	Mass Housing Resett. projects FCT. (prototype)	12 weeks	2006 -2010	2008 – 2013	100	104 weeks	866%

Source: Public Building Department

Strategies for Managing Contractual Claims

Table 6 present the mean ranking of the strategies for contractual claims management, they are adequate use of professionals should be employed, ensure adequate and proper communication during construction, avoid design modification, ensure control during planning and implementation phase and ensure suitable procurement method. 1st,2nd,3rd,4th,5th. These went in accordance with the studies of Sharafadeen (2015), Obiegbu (2012), they assert that the identified factors can greatly influence project performance either positively or negatively depending on their implementation. Also Maina (2012), in his study point out that integrated contract procurement enhances better project performance in terms of risk control, cost and time escalation.

Table 6 : Strategies for Managing Contractual Claims

Strategies for managing contractual claims	Client		consultant		Contractor		Overall	
	mean s	Rank	Mean	rank	Mean	rank	Mean	Rank
Adequate use of professionals should be employed	5	2	4.77	1	4.86	1	4.88	1
Ensure adequate and proper communication amongst party	4.86	5	4.74	2	4.66	3	4.75	2
Avoid design modification during construction	4.94	3	4.52	6	4.56	5	4.67	3
Ensure control during planning and implementation phase	4.71	9	4.71	3	4.6	4	4.67	4
Ensure suitable procurement method	5	1	4.45	8	4.53	6	4.66	5
Good contract management	4.71	8	4.57	5	4.66	2	4.65	6
Good client financial capability	4.71	7	4.48	7	4.46	10	4.55	7
Project document should be interpreted correctly	4.43	14	4.68	4	4.53	8	4.55	8
Establish quality control measures	4.77	6	4.37	10	4.46	9	4.53	9
Resources should be correctly determined and allocated	4.29	15	4.4	9	4.53	7	4.41	10
Built good team spirit	4.71	10	4.34	11	4	13	4.35	11
Enough materials should be provided	4.6	12	4.28	13	4.13	12	4.34	12
Functional site layout must be assessed and provided	4.43	13	4.31	12	4.2	11	4.31	13
Encourage self- motivation	4.71	11	3.84	15	3.6	15	4.05	14
Partial payment during construction should be avoided	4.89	4	3.88	14	3.86	14	4.21	15

Comparing perceptions of professionals on the Strategies of contractual claims

The findings from table 7 shows the Spearman's rank correlation revealed a perfect positive correlation among the different groups of respondents. This indicates that the respondents have the same view as regard the strategies for managing contractual claims.

Table 7: correlation test Comparing perceptions of professionals on the Strategies

Respondents	**Rho(P_{cal}) = 1 – $\frac{6x(\sum di^2)}{N x (N^2 –1)}$**	**Relationship**
Client versus Consultant	0.980	Strong
Consultant versus Contractor	0.995	Strong
Client versus Contractor	0.972	Strong

Source: Researchers Analysis (2017)

Factor analysis reporting the three cluster strategies of contractual claims on Table 8

The questionnaire was tested for reliability through Cronbach coefficient alpha (α). The test results indicated the Cronbach coefficient alpha value for the strategies for managing contractual claims is =0.948. This exceeds the cut-off of 0.70 (Zikmund, 2009; Ogwueleka, 2011) indicating that the variable constructs were highly reliable and free from random error. Kaiser-Meyer-Olkin Measure of Sampling Adequacy (KMO) was tested with the data for the strategies for managing contractual claims, returning a value of sampling adequacy 0. 855. This is considered sufficient to conduct a factor analysis as any value above 0.6 (the cutoff point) is considered acceptable (Eiselen et al. 2007). The p-value of Bartlett's test of sphericity (represented by "Sig"), indicates a measure of the multivariate normality of the set of distributions. According to George and Mallery (2003), a significant value < 0.05 indicates that the data does not produce an identity matrix and are thus acceptable for factor analysis. This set of data returned a significance value of 0.000, indicating that the data was acceptable for factor analysis.

Effective Coordination: Ten items were loaded onto this factor, as presented in table 8, with a variance of 35.015%. The strategies identified, agree with the study of Sharafadeen et al (2015), Jimoh (2012) and Yng et al (2002) who itemize that the above findings will help in managing contractual claims and Maina (2012), highlights that integrated contract procurement enhances better project performance in terms of risk control, cost and time escalation.

Effective Communication: Three items were loaded onto this factor, as presented in table 8, with a variance of 22.966%. This agree with the study of Obiegbu (2012), Yng et al (2002) and Sharafadeen et al (2015) who pin point that the above strategies will help curtail claims and promote project performance.

Effective Resource Utilization: Two items were loaded onto this factor, with a variance of 20.929%. The study of Obiegbu (2012) agrees with the submission.

TABLE 8: Strategies Cluster for contractual claims management.

Cluster Factor Groupings Factor	Factor Loadings	Eingen Values	% of Variance	Mean	Communalities extraction
Effective Coordination		**9.4**	**35.015**		
Adequate use of professionals should be employed	0.724			4.88	0.817
Avoid design modification during construction	0.778			4.67	0.712
Ensure suitable procurement method	0.784			4.66	0.91
Good contract management	0.582			4.65	0.781
Good client financial capability	0.597			4.55	0.758
Establish quality control measures	0.645			4.53	0.808
Built good team spirit	0.602			4.35	0.826
Enough materials should be provided	0.531			4.34	0.575
Partial payment during construction should be avoided	0.849			4.21	0.862
Encourage self- motivation	0.739			4.05	0.584
Effective Communication		**1.3**	**22.966**		
Ensure adequate and proper communication amongst party	0.743			4.75	0.885
Ensure control during planning and implementation phase	0.861			4.67	0.881
Project document should be interpreted correctly	0.785			4.55	0.752
Effective Resource Utilization		**1.1**	**20.929**		
Resources should be correctly determined and allocated	0.902			4.41	0.803
Functional site layout must be assessed and provided	0.670			4.31	0.883
			78.91%		

Table 9 present average factor loading for the strategies of managing contractual claims, the grouped strategies should be collectively assessed for better public project performance. The strategies are ranked in their order of importance, it shows that Effective Communication Cluster with average factor loading of 4.60 is very crucial to the attainment of the study goal as such due consideration should be observed. Effective Coordination and Utilization of Resources Clusters with average factor loadings of 4.50 and 4.30 should not be over looked as collective implementation of the strategies will yield an effective time and cost performance in public building projects.

Table 9: Average Factor Loading

Strategies (Clusters)	Average Factor Loading	Rank
Effective Communication	4.60	1
Effective Coordination	4.50	2
Effective Utilization of Resources	4.30	3

CONCLUSION AND RECOMMENDATIONS

The study assessed the impact of contractual claims on the performance of public building projects with the view to evolving strategies for effective management of contractual claims in public building construction projects. The study concluded that contractual claims impact public projects in terms of cost and time performance, with cost increase averaging16.68% and time increase of 31% - 866%. The findings show that high level of professionalism is needed in the building industry. To avert these issues, the study evolved that effective communication, coordination and utilization of resources should be observed. Based on the findings of the research, the study recommend that all parties to a contract should ensure effective communication, coordination within the project, and effective utilization of resources on public building projects.

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EFFECT OF CONTRACTUAL RISKS ON BUILDING CONTRACTS IN ABUJA, NIGERIA

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Construction project activities are carried out by different parties and each of the activities has its risk which results in cumulated associated risk for the project under different circumstances. They are mostly influence to contractual risks which occur as a function of contract provisions and clauses. This study aims to examine the effect of contractual risks on building contracts with a view to suggesting strategies for minimizing the likelihood of occurrence of the risks factors. In order to achieve this aim, 35 potential risk factors were identified from standard form of contracts. Data were collected through questionnaires distributed to consulting and construction firms in Abuja. Analysis of data was using Mean Item Score and T- test. The observed P value of 0.458 was greater than 0.05. Findings revealed that there is no significant difference between the perception of consulting and construction firms on the level of awareness of the contractual risk factors. It was concluded that Contractor and consultant have adequate knowledge of risk and their sources in building contract. The study however recommended that risk management should be integrated into project management processes to improve building contract in Abuja.

Key words: Building contract, Contractual risks, Potential risk, Risk management,

INTRODUCTION

Risk is inherent in all human endeavors and construction projects are no exception as they involve activities that are prone to different type of risks (Ogunsanmi, *et al.* 2011). When comparing construction industry to other industries, it is subject to risk and uncertainty due to the unique features of construction activities (Smith, 2003). Project activities are also carried out by different parties and each of the activities has its own risk, which results in cumulated associated risk for the project (Al-Sobiei, 2005). Haseeb *et al.* (2011) opined that risks affect construction sector negatively and focusing on risk reduction measures is important. However, it has been criticized for its expensive and wasteful nature, low productivity, quality problem and project delay. The reasons for all these are as varied, diverse and complex as the products of this industry itself. The process of developing a project from initial investment appraisal to completion and into use is complex (Flanagan and Norman, 2003).

Project Management Institute (PMI) (2012) and Association for Project Management (APM) (2012), defines risk as an uncertain event or condition that, if it occurs will have either a positive or negative effect on the objective, which are usually cost, time, scope and quality project.

Previous research on contractual risks in construction projects focused on risks identification, impact of risks on project delivery, and risks management strategies in public private partnership projects (Ahmad *et al.*, 2007; visser and joubert, 2008; Makui *et al.* 2009; Ehsan *et al.* 2010; Ojo, 2010; Fong, 1987; Thomas and Bone, 2002; Al-Bahar and Crandell, 1999; Raftery, 1999).

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It has become imperative to critically address the factors that influence contractual risks on Building contract in Abuja, Nigeria in order to ascertain not just their sources but also their degree of intensity or severity. These research works however failed to identify factors that affect contractual risks on building contracts and there is little understanding of the implication of these factors as they influence contractual relationship between parties to contract as it relates to their obligations and duties within the confines of contracts. Hence, the focus of the study is to examine the effect of contractual risks on building contracts with a view to suggesting strategies for minimizing likelihood of occurrence of the risks factors. In order to achieve this aim, 35 potential risk factors were identified from standard form of contracts and objective is to compare the level of awareness of various contractual risks among consulting and construction firms in Abuja. The hypothesis of the study which is in line with the objectives states that: the perception of consulting and construction firms on the level of awareness of contractual risk factors does not differ significantly.

Risks in Construction Projects

Risk is a challenging concept to define, understand and ultimately to manage. This is primarily because risk often means different things to different people. Historically, risk is defined as the possibility that the actual input variable and the outcomes may vary from those originally estimated (Correia *et al*., 1989; Remenyi *et al.,* 1993). This implies that the extent of the possible difference between the actualities and expected value reflects the magnitude of the risk. Although the word 'risk' is usually used in the context of a potential hazard or the possibility of an unfortunate outcome resulting from a given action (Correia *et al.,* 1989), intrinsically risk may be either positive or negative.

Risk in construction has been the object of attention because of time and cost over-runs associated with construction projects. Although, Porter (1981), Healey (1982) and Perry and Hayes (1985) have expressed risk as an exposure to economic loss or gain arising from involvement in the construction process; Mason (1973) and Moavenzadeh (1976)have regarded this as an exposure to loss only. But Bufaied (1987) in his work describes risk in relation to construction as a variable in the process of a construction project whose variation results in uncertainty as to the final cost, duration and quality of the project.

The development of a construction project is fraught with enormous risks; this is due to the uniqueness of every project, the uncertainties introduced by the project stakeholders, statutory or regulatory protocols and other intrinsic and extrinsic constraints. The general consensus in current literature in the field of risk management incorporates four core steps in the process of risk management (Thomas and Bone, 2002; Al-Bahar and Crandell, 1999; Raftery, 1999). These are:

i. Risk identification
ii. Risk analysis
iii. Risk response
iv. Risk monitoring

Studies carried out by Akintoye and Mcleod (1997), Olatunji (2007) Onukwuba *et al.* (2009) and Tang (2009) identified some risks contractors are commonly exposed to while executing contracts. These risks are grouped into; Contractual, Political, Performance, Financial, Technical and Environmental risks.

Of the above mentioned classifications, contractual risks have been recognized from literature to have the most adverse consequences on the successful completion of construction. Akintoye and McLeod (1997) revealed that “more premiums are applied on contractual risk than other forms of risk”, because Contractual risks are associated with flaws in documents, inappropriate documents, or improper contractual relationship. The consequences of this risk are claims and dispute, disruption of work, stoppages of work, lack of co-ordination, delays and inflated costs (Bufaied, 1987). Contractual risks are also found to be the most encountered by contractors from the study of Olatunji (2007). Hefound out that “Contracts are mostly breached in respect of parties not fulfilling the terms of the contract as stated in the Standard forms of building contract”, thereby resulting in project duration extension or otherwise.

The following in Table 1.1 are potential risks factors drawn from the clauses in the standard forms of building contracts that relate to the parties to the contract in respect of their obligations and duties that could act as contractual risks.

Table 1 Potential Risk Factors and their clauses.

Risk Factor No.	Potential Risk Factors	JCT 2005 Clause	SFBC 1990 Clause
RF 1	Delay in obtaining access to site	2.4,2.5,2.6,2.29.5	21.1
RF 2	Scope of work not properly defined	2.15,2.16	3.4
RF 3	Inadequate or insufficient site information	2.12	3.1,3.2,3,4
RF 4	Unfair or unrealizable program of work	2.17	1.3
RF 5	Misinterpretation of contract conditions	2.12	12
RF 6	Delay in setting out of the works	2.10	5
RF 7	Defective/incorrect design	2.14,2.15,2.20,2.19	12
RF 8	Changes in the design	2.12	6
RF 9	Discrepancies in drawings and specifications	2.16, 2.15,2.20	3.31
RF 10	Drawings and documents are not issued in time	2.9,2.12	3.2
RF 11	Increase to the scope of work	2.7,2.17	6.4
RF 12	Scope of work differs from contract	2.7,3.18	12
RF 13	Adjustment to the completion time of project	2.28,2.29	23
RF 14	Inaccessibility to necessary contract documents	2.8,2.9 3.1,3.3,	3.4
RF 15	Discrepancies in the Bill of Quantities	2.13	12
RF 16	Contract documents used other than the purpose of the contract	2.4.12	3.7
RF 17	Interference in the progress of work	2.33	16.1
RF 18	Imposing of subcontractors	3.15	27.1
RF 19	Imposing of suppliers	3.9	28.1
RF 20	Assigning part of the work without consent	2.33,7.1 16.1,	17.1
RF 21	Third party nomination without consent	3.3	27.1
RF 22	Delay in resolving disputes.	9.2	35.1
RF 23	Delaying in issuing and responding to instruction	2.17,2.27	2.3.1,2.3.2,1.2
RF 24	Verbal instructions not backed by writing	3.12,3.13	2.3
RF 25	Delay in making interim payment	4.11,4.13	30.1
RF 26	Delay in issuing interim certificate	2.30,4.9	30.1.1
RF 27	Failure to honour claims	5.5	
RF 28	Delay in making interim valuations	4.11	30.11
RF 29	Delay in issuing final certificate	4.15,1.10	15.1,30.5
RF 30	Delay in making final payment	4.15	30.6
RF 31	Addition of unreasonable taxes and charges to contract sum	4.6	4.2
RF 32	Failure to write instruction regarding variation	5.2.1	11.3
RF 33	Failure to reimburse for direct loss and expenses	4.23	11.8,24
RF 34	Determination of contract	8.2	26.1
RF 35	Retention money not returned	4.10,4.18,4.20	16.1.6

Source: JCT 2005 & SFBC 1990

Stakeholders Perception on Contractual Risk

According to Othman and Harinarain (2011), as soon as the client and the contractor have signed a contract they have taken on board risks. Their awareness of the risk, and the steps they have taken to minimize their share of the risk, will determine the likelihood of a problem occurring. Risks are spread through the whole project life cycle and many risks occur at more than one phase, with the construction stage as the most risky phase, It is concluded that clients from the feasibility phase onwards to address potential risks in time, and contractors with robust construction and management knowledge must be employed early to make sound preparation for carrying out safe, efficient and quality construction activities (Zou *et al*. 2006). And risks are inherent in construction production components which affect production cost and overall project cost (Al-Momani, 2000). Project activities consume resources during production or execution and the successes of any project is attributed to the adequate provision of the necessary resources and are major considerations the contractors put first during pricing (Warsame, 2006; Onukwube et al. 2009; Chitkara, 2008; Rahman et al. 2013).

Production cost constitutes a major aspect of the overall construction project cost. Bertelsen and Nielsen (1997) assert that most cost in construction is experienced in the execution phase with about 85 percent is consumed while the remaining 15 percent goes for management and supervision. Finding from Ibrahim *et al*. (2010) and Skoyles (2000) revealed that materials account for 50-65% of the total project cost in construction projects while Shashank et al. (2014) and Hanna et al. (2005) opined that labour costs comprise 30 % to 50 % of overall project cost. The contractors and consultants have not given adequate attention to evaluate the risk factors associated with production cost estimate and this is one of the major reasons why the overall project costs are hardly stable in the construction industry (Emmanuel and Anjiba 2015).

The study of Emmanuel and Anjiba (2015) shows that there is no significant difference between the perception of contractors and consultants concerning the risk factors in building projects, which admit a high level of agreement between the perception of contractors and consultants. Contractors and Consultants must work cooperatively from the feasibility stage onwards to address potential risk in time, and contractors' robust construction and management knowledge must be employed early to make sound preparation for delivery out efficient and quality construction program (Luka and Ibrahim 2015).

In the studies carried out by Akintoye and McLeod (1997), the perception of risk by contractors and project managers in UK revealed that contractors perceived risk as Factors which can adversely affect the successful completion of a project in terms of budget and schedule which in themselves are not always identifiable. The likelihood of physical, contractual or economic conditions becoming more difficult than those allowed for in the price, loss of money, loss of reputation, and a chance of an accident occurring to persons on property, The degree of certainty that the financial objectives for each particular project will be achieved and the extent to which risk factors can be quantified at bid stage and monitored closely, Tender or on-site performance mistakes leading to quality underperformance, cost over-run and an impact on all of these from a variety of unforeseen circumstances etc. while Project managers perceive risk as the activities/occurrences which traditionally are likely (or to some degree will happen) to happen, and to have an adverse effect upon programme and/or cost, uncertainty with regard to events and their effects which affects the project outcome in terms of cost, time, quality and any other relevant performance criteria and something to be avoided or transferred.

Zuofa *et al.,* (2012) discovered that Contractors perceive risk as those factors that jeopardize their abilities to meet predefined project scope, cost and time and risks are depicted as any event that has a negative effect on their operations, they also identified tight project schedules, inaccurate estimating, poor project management, resource incompetence, inadequate safety measures and unsafe operations, subcontractor's inexperience and excessive bureaucracy as risk factors while performing contracts in the Niger Delta area in Nigeria.

Furthermore in a study carried out in Palestine by Enshassi *et al.,* (2008), Contractors perceived financial failure and working at hot (dangerous) areas to be the most important construction risks followed by border closure while the least important risk, from the contractors' perspective is the risk of new governmental acts followed by the risk of rushed bidding process in building projects in Palestine.

It is generally recognized that those within the construction industry are continually faced with a variety of situations involving many unknown, unexpected, frequently undesirable and often unpredictable factors (Fong, 1987). Ashley (1977) and Kangari and Riggs (1989) have all agreed that these situations are not limited to the construction industry; it is recognized that risk is built into any commercial organization's profit structure and is a basic feature of a free enterprise system.

In managing construction project risks, determining the types of project risks and classifying it into several groups in which it belongs is a fundamental step as it could enable the assessment process to be carried out later on in determining the level of each risks and the severity effects of it in a project undertakings. Early risk identification ensures that team effort is concentrated in critical areas, focusing the project team's attention on actions and resources where there is a major risk exposure, or where the greatest time and cost savings can be made through streamlined project management.

Managing construction project risks from the beginning will contribute to early risks response where problems are reduced as they are identified, it is therefore different from the traditional approach in project management whereby risks are responded only when problem occurs. This is not good as it will incur a lot of time and cost as well as effort.

RESEARCH METHODOLOGY

A survey design approach was employed in this study with quantitative data gathered from respondents. The research population constituted registered Quantity Surveyors working in construction companies and Quantity Surveying consulting firms within Abuja, the federal

capital territory. The rationale for this selection is due to their (QS) involvement in the preparation of valuation and payment certificate. Abuja was selected for this study because it is the administrative headquarters of Nigerian; it is one of the metropolitan cities in Nigeria that has the highest population of built environment professionals and has many ongoing construction projects.

In order to guarantee equal representation for each of the identified groups/strata in the population, stratified random sampling method was adopted. The respondents were first categorized into different strata before they were selected and randomly sampled accordingly.

It is clear from Table 1 that the sample frame for the study included: 81 Quantity surveying firms and 79 construction firms making up a total of 160 respondents. These value (160) was subjected to Dorothy (2008) sample size computation. The value was reduced to a minimum of 81**. 10%** confidence interval was selected for the study, showing that 81 is the minimum number of questionnaires that can be administered within the population.

Table 1: Sample frame of the study

Respondent	Total number of questionnaire administered	Total number of questionnaire returned
Quantity surveying firms	81	41
Contractors (FOCI Registered)	79	40
Total	**160**	**81**

Source: NIQS & FOCI (2016).

The collected data were analysed by using the descriptive method (Mean Item Score). Data processing was done with the aid of Statistical Package for social sciences (SPSS) software. The MIS was used to determine weighted mean average of the identified measured and the premise of decision for the ranking is that the factor with the highest MIS is ranked 1st and others in such subsequent descending order. In order to determine the statistical significant differences between mean of various group of respondents (Quantity Surveyors), the T-TEST was used to analyse the differences. The level attached to the possible effects on Level of awareness of various contractual risks among consulting and construction firms.

RESULTS AND DISCUSIONS

Perception of Contractual Risks Factors between Consulting and Construction Firms

The study compare the perception of consultant and construction firms on the level of awareness of various contractual risks on the building contract. A total of 35 risk factors were identified from literature as the common factors that influence contractual risks on building contract. The consulting and construction firms were asked to rank these factors according to the extent they perceived the influence of the factors on the level of awareness. The mean and the rank of each factor were calculated based on the construction and consulting firm's perceptions in Abuja and the result of the comparison is shown in Table 2.

The result of the analysis shown in Table 2. Finding revealed that based on the consulting firm perceptions, Verbal instructions not backed by writing was ranked highest with the mean score of 4.475, followed by Assigning part of the work without consent and Imposing of subcontractors with mean scores of 4.400 and 4.225 respectively. Delaying in issuing and responding to instruction, Delay in interim payment and Delay in issuing interim certificate were ranked next with mean scores of 4.200, 4.150 and 4.125 respectively, while Drawings and documents are not issued on time, Increase in the scope of work and Delay in obtaining access to site ranked seventh, eighth and ninth with mean scores of 4.100, 4.050 and 3.975 respectively. Contract documents used other than the purpose of the contract and Delay in final payment were the factors ranked least by consulting firm with the same mean score of 2.725 but difference standard deviation respectively. This indicates that these factors do not have significant influence on building contract in regard to the level of awareness. Other factors ranked by the consulting firm based on their perceptions are between these extremes as shown in Table 2.0. This shows that contractors perceived Verbal instructions not backed by writing and Assigning part of the work without consent as major factors influence contractual risk on level of awareness which may eventually result to dispute, poor quality of work, delay and disruption of work.

In order to compare the perceptions of construction firm in regard to level of awareness of contractual risk on building contracts, 35 risk factors were also identified from extensive literature were ranked by the construction firm based on their perceptions of the level of awareness of contractual risks on building contract. The result of the analysis is presented in Table 4.11. The results revealed that Delay in final payment was ranked the highest factor influence contractual risks as per level of awareness with mean score of 4.600, followed by Delay in issuing final certificate with mean score of 4.550, Delay in issuing interim certificate and Discrepancies in drawings and specifications were ranked 3th and 4th with mean score of 4.525 and 4.475 respectively. The factors ranked 7th and 8th were Discrepancies in the Bill of Quantities and Drawings and documents are not issued on time with mean score of 4.68 and 4.225 respectively. The factor ranked least among the factors influence contractual risks as per level of awareness as identified in this study based on construction firm perception is Unfair or unrealizable program of work with mean score of 2.500. Other factors ranked by the construction firm based on their perceptions are between these extremes as shown in Table 2.0. The results from Table 4.11 also indicate that the construction firm perceived Delay in final payment, Delay in issuing final certificate and Delay in issuing interim certificate. The results also informed that when the financial need of the project is not aligned with the project milestone, it can lead to stoppage which has both cost and time implications on the project.

Table 2: Perception of Contractual Risks Factors between Consulting and Construction Firms

S/NO	Risk Factors	Consulting Firms			Construction Firms		
		Mean Score	StDev	Rank	Mean Score	StDev	Rank
1	Verbal instructions not backed by writing	4.475	0.632	1st	3.975	0.821	12th
2	Assigning part of the work without consent	4.400	0.860	2nd	2.725	0.806	32nd
3	Imposing of subcontractors	4.225	0.851	3rd	2.750	1.356	31st
4	Delaying in issuing and responding to instruction	4.200	0.748	4th	4.275	0.547	6th
5	Delay in interim payment	4.150	1.014	5th	4.475	0.499	5th
6	Delay in issuing interim certificate	4.125	0.871	6th	4.525	0.632	3rd
7	Drawings and documents are not issued on time	4.100	0.735	7th	4.225	0.418	8th
8	Increase in the scope of work	4.050	0.773	8th	3.850	0.691	16th
9	Delay in obtaining access to site	3.975	0.689	9th	3.025	1.351	25th
10	Delay in resolving disputes.	3.800	1.030	10th	3.900	0.663	14th
11	Retention money not returned	3.800	0.843	11th	2.775	0.908	30th
12	Delay in making interim valuations	3.675	0.818	12th	4.125	0.599	9th
13	Adjustment to the completion time of project	3.525	1.000	13th	3.425	1.138	22nd
14	Imposing of suppliers	3.475	1.024	14th	2.550	1.284	34th
15	Misinterpretation of contract conditions	3.475	0.866	15th	3.075	0.905	24th
16	Defective/incorrect design	3.475	0.632	16th	3.850	0.792	15th
17	Scope of work not properly defined	3.450	1.264	17th	2.825	1.430	29th
18	Discrepancies in drawings and specifications	3.425	0.771	18th	4.475	0.707	4th
19	Inadequate or insufficient site information	3.375	1.177	19th	2.850	0.792	28th
20	Interference in the progress of work	3.325	0.848	20th	3.500	1.025	21st
21	Delay in issuing final certificate	3.250	0.859	21st	4.550	0.589	2nd
22	Failure to honour claims	3.225	1.060	22nd	3.925	0.848	13th
23	Discrepancies in the Bill of Quantities	3.225	0.935	23rd	4.275	0.447	7th
24	Failure to write instruction regarding variation	3.200	0.678	24th	3.550	1.139	20th
25	Determination of contract	3.175	1.046	25th	3.700	0.954	18th
26	Scope of work differ from contract	3.150	1.152	26th	4.025	0.689	11th
27	Third party nomination without consent	3.150	0.937	27th	2.600	1.158	33rd
28	Failure to reimburse for direct loss and expenses	3.125	1.100	28th	4.050	0.740	10th
29	Unfair or unrealizable program of work	2.975	0.851	29th	2.500	1.072	35th
30	Addition of unreasonable taxes and charges to contract sum	2.925	0.721	30th	2.900	0.539	27th
31	Changes in the design	2.825	1.093	31st	3.725	0.922	17th
32	Inaccessibility to necessary contract documents	2.800	1.187	32nd	3.575	1.138	19th
33	Delay in setting out of the works	2.725	0.836	33rd	3.225	0.880	23rd
34	Contract documents used other than the purpose of the contract	2.725	0.806	34th	3.025	0.689	26th
35	Delay in final payment	2.725	0.774	35th	4.600	0.490	1st

Source: Researcher's Analysis of Data (2017)

Comparison of Perception of Contractual Risks Factors between Consulting and Construction Firms on the Level of Awareness

The result of the T – test for the comparison of perception of contractual risks factors between consulting and construction firms is presented in Table 2. The discussion of this result thereafter follows.

In the T - test presented in Table 2, it was observed that there exists a non-statistically significant difference between the perception of consulting and construction firms on the level of awareness of 35 contractual risk factors. The mean values observed for the perception of the consulting firms is 3.4771 while that of the construction firms is 3.5829. This also implies that the construction firms are better aware of the contractual risk factors than the consulting firms. The observed T calculated value of 0.747 was greater than the T tabulated value of 1.98, while the observed P value of 0.458 was greater than 0.05. The null hypothesis, which states that the perception of consulting and construction firms on the level of awareness of contractual risk factors does not differ significantly, was therefore accepted.

Table 3: T-Test Result on the Comparison of Perception of Contractual Risks Factors between Consulting and Construction Firms

	Variables Tested		Observations Mean Values				Inferences	
Analysis No.	X_1	X_2		T_{cal}	T_{tab}	P_{value}	Remark	Action on H_O
1	Consulting Firm	Construction Firm	$X_1 = 3.4771$ $X_2 = 3.5829$	0.747	1.98	0.458	NSD	Accepted

Source: Researcher's Analysis of Data (2017)

DISCUSSION OF RESULT

The result from this study on comparison of Contractual Risks Factors between Consulting and Construction Firms on level of awareness. Finding revealed that based on the consulting firm perceptions, Verbal instructions not backed by writing was ranked highest with the mean score of 4.475, followed by Assigning part of the work without consent and Imposing of subcontractors with mean scores of 4.400 and 4.225 respectively. Delaying in issuing and responding to instruction, Delay in interim payment and Delay in issuing interim certificate were ranked next with mean scores of 4.200, 4.150 and 4.125 respectively. This shows that contractors perceived Verbal instructions not backed by writing and Assigning part of the work without consent as major factors influence contractual risk on level of awareness which may eventually result to dispute, poor quality of work, delay and disruption of work.

This result agrees with the findings of El-razak *et al.* (2014) and Wiguma *et al.* (2005). El-razak *et al.* (2014) opined that Accidents & theft, Extent of float in contract schedule, Receiving interim certificates, Retention, Delays in payments from client, Provision for fluctuation payments, Estimating error, Provision for interim certificate, Material delay, Agreeing interim valuations on site, Delay in agreeing variation, Delay in settling claims are the critical factors that influence contractual risk in Egypt.

Wiguma *et al.* (2005) stressed that Unforeseen site ground condition, Weather condition, Difficult in obtaining permits and ordinances, Changes in government actions, High inflation/ increased price, Delayed payments on contract, High interest rate, Defective design, Design change by owner, Inadequately compensated variation order, Defective construction work, Low labour and equipment productivity, Low labour and equipment productivity are the critical factors that influence contractual risks in united kingdom. Although the studies used Relative Important Index (RII).

Based on the T – test, it was observed that there is no statistically significant difference between the perception of consulting and construction firms on the level of awareness of 35 contractual risk factors. The mean values observed for the perception of the consulting firms is 3.4771 while that of the construction firms is 3.5829. This also implies that the construction firms are better aware of the contractual risk factors than the consulting firms. The observed T calculated value of 0.747 was greater than the T tabulated value of 1.98, while the observed P value of 0.458 was greater than 0.05. The null hypothesis, which states that the perception of consulting and construction firms on the level of awareness of contractual risk factors does not differ significantly, was therefore accepted.

This result is also in line with the findings of Emmanuel and Anjiba, (2015) which shows that there is no significant difference between the perception of contractors and consultants concerning the 62 risk factors in building projects, which admit a high level of agreement

between the perception of contractors and consultants. The mean values observed for the perception of the consultant is 60.72 while that of the contractors is 64.28. This also implies that the contractors has high level of agreement than the consultant. The result of the Mann Whitney U test shows that a p-value of 0.581 > 0.05 implies acceptance.

CONCLUSIONS AND RECOMMENDATION

The study aimed to examine the influence of contractual risks on building contracts in Abuja, Nigeria. However, the study concluded that contractual risks has adverse consequences on the successful completion of projects. Finding revealed that based on the consulting firm perceptions, Verbal instructions not backed by writing was ranked highest with the mean score of 4.475, followed by Assigning part of the work without consent and Imposing of subcontractors with mean scores of 4.400 and 4.225 respectively. Delaying in issuing and responding to instruction, Delay in interim payment and Delay in issuing interim certificate were ranked next with mean scores of 4.200, 4.150 and 4.125 respectively. This shows that contractors perceived Verbal instructions not backed by writing and Assigning part of the work without consent as major factors influence contractual risk on level of awareness which may eventually result to dispute, poor quality of work, delay and disruption of work.

In order to compare the perceptions of construction firm in regard to level of awareness of contractual risk on building contracts. The results also revealed that Delay in final payment was ranked the highest factor influence contractual risks as per level of awareness with mean score of 4.600, followed by Delay in issuing final certificate with mean score of 4.550, Delay in issuing interim certificate and Discrepancies in drawings and specifications were ranked 3th and 4th with mean score of 4.525 and 4.475 respectively. The factors ranked 7th and 8th were Discrepancies in the Bill of Quantities and Drawings and documents are not issued on time with mean score of 4.68 and 4.225 respectively. The results also informed that when the financial need of the project is not aligned with the project milestone, it can lead to stoppage which has both cost and time implications on the project.

Findings also revealed that there is no significant difference between the perception of consulting and construction firms on the level of awareness of the contractual risk factors. It was concluded that Contractor and consultant have adequate knowledge of risk and their sources in building contract. The study however recommended that risk management should be integrated into project management processes to improve building contract in Abuja.

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ASSESSMENT OF THE COST IMPLICATION OF REVIVING ABANDONED PUBLIC PROJECTS IN ABUJA, NIGERIA

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The issue of abandoned projects have remained a teething and perennial problem in most developing countries and Nigeria has not been spared the agony associated with this development. In addition to abandoned project suffering from time and cost overruns, the people are denied the benefits of access to basic services. Thus, this study assessed the cost implication of reviving abandoned public projects with a view to proffering possible solutions towards reducing the issue of project abandonment. The study adopted observation, interview and questionnaire survey approach, in which quantitative data were gathered from in-house construction participants from FCDA and contractors to FCDA within the study area, through the use of structured questionnaire. Percentile, Relative Important Index (RII), Pearson Product-Moment Correlation Coefficient, T-Test and Mann-Whitney U Test were used in the analysis of data gathered. The study reveals that there is a significant statistical relationship between the initial contract sum and the revised contract sum with a mean value of 169,608,856.96, t-value of 2.813, 24, at 95% confidence level. Also, with an effect size of 0.24, it was concluded that there is a larger portion of variance between the initial contract sum and the revised contract sum of abandoned public projects. A significant relationship was observed between the period of project abandonment and the additional cost incurred in reviving them, and average of 50% original contract sum is required depending on the period of abandonment to revive abandoned project. Also, to reduce the incidence of project abandonment; initiating only projects which can be completed with the available resources, ensuring accountability, transparency, honesty and integrity in selecting project participants, creating policies that will ensure continuity of construction works after the exist of one government, and accurate estimation of quantities and cost for projects were considered the most important measures. The study recommended that Government should create policies that will ensure continuity of projects after exit of initiating government; and such policies should be enforceable.

Keywords*: Project abandonment, cost implication, public construction project, Abuja*

INTRODUCTION

The construction industry plays an important role in the economy, and the activities of the industry are also vital to the achievement of national socio-economic development goals of providing shelter, infrastructure and employment. In Nigeria, Aibinu and Jagboro (2002) observed that the construction industry continues to occupy an important position in the nation's economy even though it contributes less than the manufacturing or other service industries. Ayodele and Alabi (2011) opined that a healthy economy usually experiences an increase in construction activities. Therefore, the successful delivery of the products of this industry is crucial for national development. Unfortunately, most construction projects delivered within the construction industry are delivered above budget and behind scheduled, while some are even out rightly abandoned (Ewa, 2013; Ogunsemi and Jagboro, 2006; Olapade and Anthony, 2012). According to Dahlan (2001) an abandoned project refers to a project in which the construction job has been delayed, even though planning consent has been approved. Olapade and Anthony (2012) further stated that an abandoned project is a project in which the client refuses to provide maintenance and working services to a building.

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According to Ubani and Okoroji (2013) the Nigerian landscape is littered with abandoned building projects, roads, rails, ports and other infrastructural projects at all levels of governance from local government through the state government and to the federal. Incessant failure and abandonment of projects by the public sector are continuously posing serious challenges to the stakeholders in the built environment.

This unhealthy situation has its effect especially in the aspect of cost which over the years has become a major criterion for measuring the success of construction projects (Chan, 2001; Ogunsemi and Jagboro, 2006). A similar view was held by Nasir (2012) which stated that there are about eleven thousand, eight hundred and eighty-six abandoned projects scattered along the length and breadth of the country. These projects will cost an expected seven hundred and seventy-eight trillion naira to complete. This invariably implies that if the government does not begin any fresh projects, it will take more than five years, budgeting about N1.5 trillion yearly, to finish them all - and that is assuming no cost-over runs or delays.

According to Olapade and Anthony (2012) effectively combating the menace of project abandonment will go a long way in providing employment opportunity for professionals in the building industry, decreasing the wastage of public funds, human and resources on the aspect of the client, as well as improved physical and socio-economic growth of the nation amid others. This further underscores the fact that abandonment of building projects has resulted in several unfavourable consequences to the economy, the public and environment. According to Yap (2013) with respect to cost, project abandonment is a waste of valuable resources.

Studies abound on the issue of project abandonment focuses on the causes and effects of project abandonment within and around the world (Ayodele and Alabi, 2011), the effects of abandoned projects on real property and its value (Efenudu, 2010, Akindoyeni 1989, Aluko, 2008), reasons for abandoned projects (Ihuah and Fortune, 2013) among others. However, the works of Efenudu, (2010) and Ayodele and Alabi (2011) and some other researchers undertake assessment of causes and effects of abandoned projects in Nigeria but the relationship between the period of abandonment and the revised completion cost of reviving abandoned projects were not considered. Hence, the need to evaluate the cost of reviving abandoned projects.

Th aim of the study is to assess the cost implication of reviving abandoned public projects with a view to proffering possible solutions towards reducing the issue of project abandonment. This study will bring to light the significant effect of these project abandonment. The study also provides empirical evidence as to the cost implication of reviving abandoned public projects. This will go a long way in helping those involved in the delivery of public projects within the country to understand the cost danger of abandoning public projects for considerable period of time. The findings will also assist policy makers in government to draft attainable policy and programmes for eradicating project abandonment in order to cover up the infrastructural gap.

To guide this study, the following hypothesis were formulated;

H_{01}: there is no significant difference between the initial contract sum and the revised contract sum

H_{02}: there is no significant relationship between the period of abandonment and cost of reviving abandoned projects

LITERATURE REVIEW

Construction Project Abandonments

According to Longman (2005), abandonment is the action of suspending activities on something totally, with no definite intention of when to restart. When events and actions on building projects are postponed without any confirmed time of recommencement the projects are said to be abandoned**.** Therefore, project abandonment can be defined as the unexpected postponement of the work progress particularly at the implementation stage such as inability to complete a contract after the completion period has elapsed. Abandonment and unsuccessful projects which are more widespread in the government sector litter every array of the nation's environment such as government quarters, university campuses, public

schools etc. The occurrence cuts across various financial sectors including the building, manufacturing/engineering and service sectors (Chinedu and Fidelis, 2011). According to Makalah (2008) abandonment in buildings occurs at the point whereby levies and mortgages are no longer paid, and those structures for which services are neither paid for nor provided. They are vacant, vandalized, boarded-up, dilapidated or those which have unmaintained basis. According to Olapade and Anthony (2012) abandonment can also be seen as the point where by client refuse to provide maintenance and working services to a building, or the failure of an owner's authoritative right to a building, or the destruction of a building.

Effect of Construction Project Abandonment

The effects of construction project abandonment according to Olusegun and Micheal (2009) are; population of users getting disappointed of the proposed project, lowering of the living standard, wastage of valuable resources, opportunities of employment becomes lower, economic activities decreases, and decrease in the revenue accruing to government. These effects are not much in difference with the effects suffered in Malaysia due to project abandonment, thus, Abdul-Aziz and Umran (2011) elaborated that in Malaysia, the end users suffer in where they are unable to reside in the houses on time as stated in the Sales and Purchase Agreement. Although they have not occupied the houses, yet they are obligated to pay monthly with interests to the banks. Apart from that, it is also common for vandalism of project sites due to project abandonment which have also led to illegal activities to be carried out at these particular places. Abdul-Aziz and Umran (2011) added that the other effects are price of raw materials increasing, building requirements changes, loans that are nonperforming and land being foreclosed. In the meantime, the possibility of non-revival of abandoned projects where it is subjected as not viable, or there are no companies that are interested in investing for the purpose of revival, results to the economy loss. There is no doubt that abandonment of a projects brings great effect to the construction industry which ultimately contributes to the downfall of the economic growth of a country. The causes and effects are not much different and are similarly faced by various countries who go through the issue of abandoned projects.

Also, the issue of project abandonment is more obvious in less developed countries like Nigeria as reported by (Akindele, 2013). Buildings will certainly depreciate and might afterward be abandoned as they mature except they are accurately maintained. Moreover, changes in technology and business development might edge out some structures; making the structure out of date and prone to abandonment. According to Adedibu and Akindele (2007) Building projects abandonment can cause common health problems in the metropolis such as diarrhea, typhoid fever, malaria and other dirt associated health problem;such abandoned sites are also vagrant's enchantment, miscreant's suitable residence and the hideout where criminals plan their activities, conclude or commit immoral acts in the area. For instance, the existence of abandoned structures has been observed to promote arson and other crimes, waste dump, and property value decline where they are present (Adedibu and Akindele, 2007).

Another obvious effect of project abandonment is the associated waste of resources. Olapade and Anthony (2012) pointed out that the misuse of resources here are in the form of capital, material and human authority. Olapade and Anthony (2012) further opined that apart from that abandonment of a building project tends to encourage prohibited activity, which consequently affects the security and comfort of a society. Therefore, when projects are abandoned they becomes an eyesore; damaging the aesthetics and artistic visualization of it and the environment. Olapade and Anthony (2012) also explained that there is an effect on the socio-economic owing to abandoned projects, where it is overwhelming looking at the enormous amount of funds and resources lost on the part of the client who has invested on that particular project.

Measures for Reducing the Occurrence of Project Abandonment

Fisk (1997) states that in order to achieve success in construction, two measures needs to be adopted. The first is the application of value engineering concept, which aims at a careful analysis of each function and the elimination or modification of anything that adds to the project cost without adding to its functional capabilities. It was argued that by carefully investigating costs, availability of materials, construction methods, procurement costs, planning and organizing, cost-benefit values and similar cost influencing items, an improvement in the overall cost of project can be realized. The second is to provide comprehensive and error free designs and specifications to avoid misinterpretations by the

contractor or delay due to missing details. Ashworth (2000) observed that profitable firms may be generating their revenues from the elimination of waste at both professional and trade practice levels. Eshofonie (2008) also stated that establishing firmly the requirements and features of the project at the onset before getting started is an effective cost control measure. Azis *et al.* (2013) also proposed; use of contractors with adequate experience on the job, use of appropriate construction methods, use of up-to-date technology, clear information and communication channels and frequent coordination between the parties.

Olapade and Anthony (2012) also opined that in order for project abandonment to be reduced in the public sector, only new projects, which can be completed with the available resources, should be initiated. Also, accountability, transparency, honesty and integrity should characterise the selection processes of both the consultant and contractors. The use of political undertone rather than economic advantage in sitting of projects should be discouraged. The study further stated that the need to set up a National Construction Industrial Bank is overdue.

Tijani and Ajagbe (2016) also recommended that adequacy of funds and budgetary allocation in compliance with the Public Procurement Act. It was also advised that governments should sustainably promote the convention of providing adequate policies and the continuity of those policies by any incoming government. There should be adequate planning for any given project, while well trained project managers should be used in project supervision. The time and cost estimation of the project should be accurate and all changes should be done before the start of construction and if the construction project has started, it should be completed and the case of abandonment should not be considered (Tijani and Ajagbe, 2016).

RESEARCH METHOD

This study covered the assessment of the cost implication of reviving abandoned public projects in Abuja. The study targeted in-house construction participants in the Federal Capital Development Authority (FCDA) and contractors located in Abuja and that are registered with Nigeria's Federation of Construction Industry (FOCI). The choice of both set of respondents premised on the fact that FCDA is the major body responsible for the delivery of public projects within the Federal Capital Territory, while FOCI is the largest umbrella body of construction contractors (Aje et al., 2015).

According to Kothari (2004), population is a collection of elements being studied and about which conclusions are to be drawn. Since this research sets out to assess the cost implication of reviving abandoned public projects in Abuja, the population of this study includes the in-house construction participants in the Federal Capital Development Authority (FCDA) as this is the major body responsible for the delivery of public projects within the Federal Capital Territory. According to the FCDA, there exist a total of 106 in-house construction professionals. This formed part of the total population of this study. Also, in order to get a balanced view of the subject, contractors within the study area and that have executed projects in the area were also included as part of the population for the study. These contractors selected are those located in Abuja and are registered with Nigeria's Federation of Construction Industry (FOCI). According to the FOCI, there are 31 construction companies in Abuja that are registered with the body (FOCI, 2016). Thus, the total population for this research are the 106 in-house construction professionals in the FCDA and the 31 registered contractors with the FOCI. Hence making the total population for the study amounting to 137 construction participants. Since this number is practically manageable and accessible, the entire 137 participants were adopted for the study.

Census method of sampling, which is a non-probability sampling method, was adopted for this study, since the population for the research falls within a manageable and accessible size; and the researcher is not concern about the representativeness of the sample, and the probability of an element being stated is unknown. Census sampling used in this study is suitable for this study since it involved an extensive field work. Furthermore, The study adopted observation, interview, and questionnaire as data collection instruments. With the observation, the researchers observed the verbal and non-verbal clues of the respondents. This gives an uninterrupted access to information. During the interview, the researchers have to record the verbal and non-verbal responses and asked questions outside the ones already listed by the researcher. The reliability of this method lies in the clarifying questions and

facial expressions which were used toe judged the reaction of the respondents to certain questions. A well-structured questionnaire administered personally to quantity surveying firms in Abuja. According to Blaxter et al. (2001), questionnaire is one of the most used technique for conducting social research, and it involves the formulation of precise written questions for the respondents, whose opinion is being sort.

The questionnaire used was designed in two sections using information derived from related literatures reviewed. Section A of the questionnaire was used to harness data on the background respondent. This was done in order to provide quality check to the data gotten from the other sections of the research instrument. Section B was divided into parts and it addressed the objectives. . Respondents were given adequate of time to reflect and fill in their responses on the questions contained in the research instrument. The Cronbach alpha test (α) was used to measure the reliability and internal consistency of the questionnaire. The normal range of Cronbach coefficient alpha (α) value between 0.0 and + 1.0, and the higher values reflects a higher degree of internal consistency. According to Pallant (2005) ideally, the Cronbach alpha coefficient of a scale should be above 0.7. The closer the alpha (α) is to 1, the greater the internal consistency of items in the instrument being assumed. The Cronbach alpha value for the possible measures of reducing projects abandonment is 0.873. Based on this value, the questionnaire is credible and have high degree of reliability as confirmed by (Pallant, 2005).

A total of 83 questionnaires were retrieved out of the 137 questionnaires administered to sets of respondents. This represents a response rate of 60.5% and were considered suitable for this study following Moser and Kalton (1999) submission. The study employed Percentile, Relative Important Index (RII), Pearson Product-Moment Correlation Coefficient, T-Test and Mann-Whitney U Test in the data analysis. Percentile was employed in analysing the background information of the respondents, Relative Important Index (RII was used in assessing the possible measures for reducing issues of project abandonment, Pearson Product-Moment Correlation Coefficient was used to ascertain if there is a significant difference between initial contract sum and the revised contract sum, T-test was used to determine the relationship between period of abandonment and cost of reviving abandoned projects, and Mann-Whitney U Test was used to confirm if there is disparity in the views of the respondents regarding the measures of reducing project abandonment. Data analysis was done using statistical package for social science (SPSS 17.0).

RESULTS AND DISCUSSION

The analysis of the background information of the respondents shows that most of the respondents sampled are from the FCDA with 67.5% while the remaining 32.5% are registered contractors within Abuja. This confirms that a good number of the respondents are FCDA in-house consultants. In terms of professionals' representation, the result revealed that Quantity Surveyors (34.9%) are more, followed by the Architect (27.7%), then the Engineers (22.9%) and lastly the Builders (14.5%). A look at the year of work experience of the respondents shows that only 9.6% of them have their year of working experience to fall within the 1 to 5 years while 18.1% and 24.1% falls between 6 to 10 and 11 to 15 years respectively. Also 27.7% and 20.5% of the population falls between the ranges of 16 to 20 years and above 20 years respectively. However, the average years of working experience of the respondents is calculated as approximately 14 years. This implies that they are experienced enough to give a valid response.

Academically, 38.5% of the respondents holds a Bachelor's degree, while 24.1%, 20.5% and 16.9% holds a Higher National Diploma, Master degree and a Post Graduate Diploma respectively. In terms of professional qualification, result reveals that most of the respondents (84.3%) are members of their respective professional bodies, except 15.7% that stated that they are not yet members of their professional bodies. Also, 77.1% of the respondents have been involved in abandoned projects while only 22.9% have not. Based on the result on the respondents' background information, it was concluded that the respondents are well equipped both academically and professionally to give reasonable insight on cost implication of reviving abandoned projects and the possible ways of militating projects abandonment. In addition, they can give reliable information since, majority of them have been involved in abandoned project.

Cost Implication of Reviving Abandoned Public Projects

Table 1 shows the result of the evaluation of the cost implication of reviving abandoned public projects. It is obvious from the table that all the identified projects experienced considerable increase in the contract sum after periods of abandonment. Result shows that an average of 49.6% deviation exist between the initial contract sum and the revised contract sum of these projects. This implies that the cost of reviving an abandoned public project is almost plus half of the initially budgeted cost of the projects.

Table 1: Analysis of the cost of reviving abandoned public projects

S/n	Project Type	Year	ICS (₦)	RCS (₦)	Dev.(₦)	% Dev.	ICD (Month)	POA (Month)
1	Building	2013	62,245,213.20	80,161,348.00	17,916,134.80	28.78	6	18
2	Building	2013	210,745,014.97	260,180,980.45	49,435,965.48	23.46	12	12
3	Building	2012	95,525,600.00	125,555,000.00	30,029,400.00	31.44	12	18
4	Building	2012	160,218,471.44	172,664,909.70	12,446,438.26	7.77	12	22
5	Building	2011	115,540,000.00	173,562,000.00	58,022,000.00	50.22	24	24
6	Building	2011	39,684,127.37	50,684,127.37	11,000,000.00	27.72	4	12
7	Culvert	2011	324,125,743.20	524,125,800.30	200,000,057.10	61.70	18	12
8	Building	2010	95,063,953.72	128,399,450.55	33,335,496.83	35.07	18	24
9	Road	2010	484,701,193.16	550,067,841.00	65,366,647.84	13.49	18	12
10	Road	2010	473,427,294.51	610,905,000.50	137,477,705.99	29.04	29	18
11	Building	2009	108,027,172.31	290,142,668.45	182,115,496.14	168.58	6	36
12	Building	2009	133,107,377.40	150,897,086.00	17,789,708.60	13.36	18	24
13	Building	2009	100,161,756.45	290,340,483.02	190,178,726.57	189.87	18	24
14	Road	2009	440,125,528.60	600,125,500.40	159,999,971.80	36.35	12	24
15	Road	2009	500,228,142.53	852,228,150.00	352,000,007.47	70.37	24	36
16	Road	2008	738,000,000.00	980,000,000.00	242,000,000.00	32.79	36	24
17	Building	2007	268,000,898.23	304,546,475.26	36,545,577.03	13.64	18	60
18	Building	2007	122,583,402.45	240,675,924.34	118,092,521.89	96.34	8	29
19	Building	2006	63,833,957.25	87,478,744.70	23,644,787.45	37.04	36	32
20	Building	2006	50,661,045.81	55,363,484.74	4,702,438.93	9.28	4	12
21	Road	2006	687,747,906.15	800,624,072.69	112,876,166.54	16.41	24	12
22	Culvert	2005	445,622,372.60	780,211,783.43	334,589,410.83	75.08	24	36
23	Building	2004	197,840,274.75	305,840,274.75	108,000,000.00	54.59	18	32
24	Building	2003	213,056,668.63	420,678,435.38	207,621,766.75	97.45	24	36
25	Road	2001	7,065,665,742.40	8,600,700,740.00	1,535,034,997.60	21.73	24	48
					169,608,856.96	**49.66**		**25**

Source: Research Analysis, 2017

Note: ICS = Initial Contract Sum, RCS = Revised Contract Sum, Dev. = Deviation, ICD = Initial Contract Duration, POA = Period of Abandonment, TCD = Total Contract

Further analysis was conducted in other to ascertain the statistical significant between the initial contract sum and the revised contract sum using paired samples t-test. Result in Table 2 reveals a mean value of 169,608,856.96, with a t-value of 2.813, 24, and a significant p-value of 0.010. Since this significant p-value derived is lower than the threshold of 0.05, it therefore implies that at 95% confidence level, there is a significant difference between the initial contract sum and the revised contract sum of abandoned public projects. The null hypothesis was therefore, not accepted. In order to ascertain the magnitude of this significant difference, the effect size was calculated using the eta squared formula stated in research method. The eta squared represents the proportion of variance of the dependent variable that is explained by the independent variable. This was further calculated as 0.24 which indicates a large effect size (difference), as it is above the 0.14 figure suggest for a large effect (Cohen, 1988). This means that there is a larger portion of variance between the initial contract sum and the revised contract sum of abandoned public projects.

Table 2: Paired Samples t-test

		Paired Differences							Sig. (2-tailed)
					95% Confidence Interval of the Difference				
		Mean	Std. Deviation	Std. Error Mean	Lower	Upper	T	df	
Pair 1	Revised - Initial	169,608,856.96	301,509,373.11	60,301,874.62	45,151,904.66	294,065,809.26	2.813	24	0.010

Source: Researchers' analysis, 2017

Figure 1 is a line graph of the cost of reviving the identified abandoned projects (i.e. the cost deviation between the initial contract sum and the revised cost), and the period of project abandonment. It is evident from the graph that public projects with high abandonment period tend to have high cost implication, aside projects 17 and 19 which experienced 60 and 32 months of abandonment but with lesser deviation in cost when compared to other projects. Reason for this could be attributed to other factors.

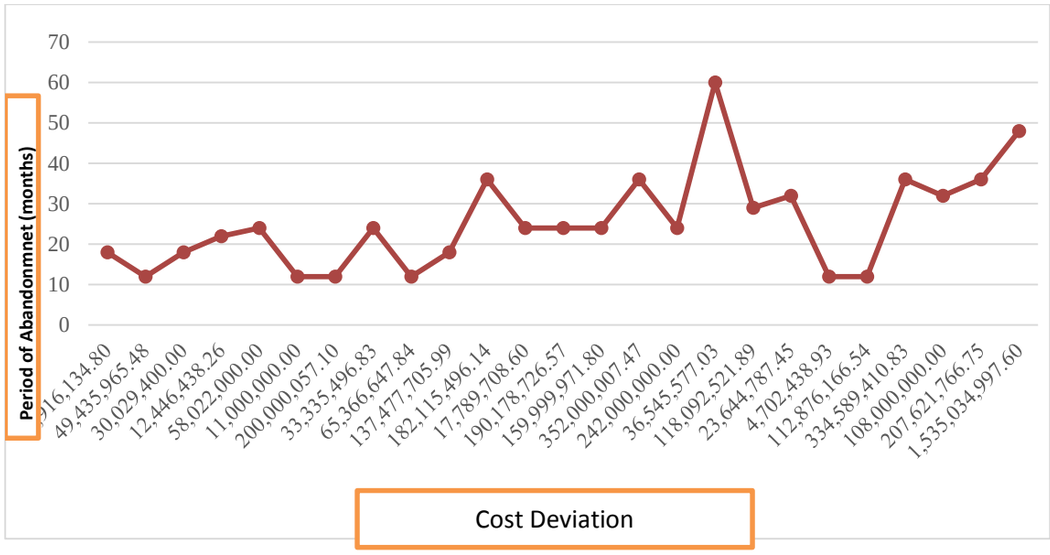

Figure 1: Line graph of period of project abandonment and the cost implication

Table 3 shows the result of the analysis between the period of abandonment and the additional cost of reviving these abandoned projects. Pearson product-moment correlation coefficient was adopted to determine if there is a relationship between the variables. Pearson product-moment correlation coefficient was adopted as it is best suited in ascertaining the relationship that exist between interval level/continuous variables; it can also be applied on one continuous variable, and one dichotomous variable (Pallant, 2005). The analysis revealed r-value of 0.456, and a significant p-value of 0.022. This result implies that at 95% confidence level, there is a positive linear relationship between the period of project abandonment and the cost of reviving such projects. With this, the null hypothesis was rejected. This result further shows that there is a negative implication in abandonment of projects on the cost delivery of projects studied. Therefore, care must be taken when planning for a project as an abandonment may lead to incurring of more cost to complete such project.

Table 3: Correlation between period of abandonment and Cost of Reviving abandoned projects

		Additional cost incurred	period of abandonment
Additional cost incurred	Pearson Correlation	1	0.456*
	Sig. (2-tailed)		0.022
	N	25	25
period of abandonment	Pearson Correlation	0.456*	1
	Sig. (2-tailed)	0.022	
	N	25	25

Source: researchers' Analysis, 2017

Findings from the analysis carried out revealed that there is a significant relationship between the period of project abandonment and the additional cost incurred in reviving them. In reviving abandoned projects, an average of about 50% increment of the initial contract sum was experienced on public abandoned projects in Abuja. This is a significant increase in the initially budgeted cost of these projects. This significant increase was as a result of additional cost of fluctuation of market price which arises due to inflation. Oladipo and Oni (2012) submitted that the issue of abandonment of public construction projects comes with its attributed cost effect, as additional cost due to the period of abandonment is incurred to complete such projects. This additional cost could have been deployed to provide other basic need for the society. Findings of this study further corroborates this assertion as it was discovered that as a result of abandonment, the cost increase in completing of such project tend to be almost half of the initially estimated cost. Such huge cost increase could have been used to serve other pressing societal issues that would have benefited the populace.

Measures for reducing Public Project Abandonment

Result in Table 4 shows the ranking of some identified measures for reducing public project abandonment. Result revealed that the most important strategies according to the in-house professionals are initiating only new projects, which can be completed with the available

resources, accurate estimation of quantities and cost for projects, creating policies that will ensure continuity of construction works after the exist of one government, and use of competent contractors with strong financial stands. However, the most important measures from the contractors' view are accountability, transparency, honesty and integrity in selecting project participants, initiating only new projects, which can be completed with the available resources, creating policies that will ensure continuity of construction works after the exist of one government, and accurate estimation of quantities and cost for projects.

Furthermore, all the assessed measures have a RII of above average of 0.5, which implies that when considered, they all have the tendency of helping in reducing issues of project abandonment in public projects. However, the most important of them all are, initiating only new projects, which can be completed with the available resources, accountability, transparency, honesty and integrity in selecting project participants, creating policies that will ensure continuity of construction works after the exist of one government, and accurate estimation of quantities and cost for projects, with a RII of 0.829, 0.814, 0.810, and 0.805 respectively. The least ranked measure is compliance to building guidelines or requirements when designing and constructing with a RII of 0.682.

Result from Mann-Whitney test conducted shows that there is a convergent view among both set of respondents as regards the identified measures except in terms of use of competent contractors with strong financial stands, as this gave a significant p-value of less than 0.05. While the in-house professionals ranked this measure as the third most important with an RII of 0.807, the contractors ranked it as the eight most important factor with an RII of 0.704. However, the consensus is that all the measures are effective for controlling project abandonment.

In order to reduce the incidence of project abandonment, findings revealed that the most important measures to consider are initiating only new projects, which can be completed with the available resources, accountability, transparency, honesty and integrity in selecting project participants, creating policies that will ensure continuity of construction works after the exist of one government, and accurate estimation of quantities and cost for projects. This finding is in line with the submission of Olapade and Anthony (2012) that only new projects, which can be completed with the available resources, should be initiated, and that the selection processes and consultant should be characterized by accountability, transparency, honesty and integrity. Ojo and Aroge (2016) further suggested that proper funding of proposed projects so as to ensure completion of same.

Table 4: Measures for reducing public project abandonment

	In-House		Contractors		Overall		Mann-Whitney	
Measures	**RII**	**Rk**	**RII**	**Rk**	**RII**	**Rk**	**Z- Value**	**Sig.**
Initiating only new projects, which can be completed with the available resources	0.829	1	0.830	2	0.829	1	-0.276	0.782
Accountability, transparency, honesty and integrity in selecting project participants	0.786	5	0.874	1	0.814	2	-1.759	0.079
Creating policies that will ensure continuity of construction works after the exist of one government	0.807	3	0.815	3	0.810	3	-0.256	0.798
Accurate estimation of quantities and cost for projects	0.814	2	0.785	4	0.805	4	-0.561	0.575
Use of competent contractors with strong financial stands	0.807	3	0.704	8	0.773	5	-2.584	0.010**
Discouraging the use of political undertone rather than economic advantage in siting of projects	0.782	6	0.726	5	0.764	6	-1.000	0.317
Use of good and applicable construction methods	0.779	7	0.704	8	0.754	7	-1.662	0.097
Prompt payment for executed works to ensure sufficient cash flow to the contractors	0.764	8	0.704	8	0.745	8	-0.585	0.559
Implementation of Value management at the early stage of the project	0.743	9	0.726	5	0.737	9	-0.410	0.682
Adequate project monitoring and supervision	0.729	10	0.726	5	0.728	10	0.000	1.000
Creation of favourable government policies against project abandonment	0.721	11	0.637	12	0.694	11	-1.547	0.122
Compliance to building guidelines or requirements when designing and constructing	0.696	12	0.652	11	0.682	12	-0.717	0.474

Source: Researchers' analysis, 2017

Note: RII = Relative Importance Index, Rk = Rank, ** Significant at $p < 0.05$

CONCLUSION AND RECOMMENDATIONS

This study assessed the cost implication of reviving abandoned public projects in Abuja, Nigeria, with a view to bringing to light the cost incurred in completing abandoned projects and proffering possible measures towards the reduction of issues of project abandonment within the study area. A survey approach was adopted, in which information was harnessed from in-house professionals in the Federal Capital Development Agency and registered

contractors. The study was able to determine the cost implication of reviving abandoned public projects and the possible measures for reducing issues of project abandonment.

Based on the findings, the study concludes that there is a significant relationship exists between the period of project abandonment and the additional cost incurred in reviving them and about 50% increment of the initial contract sum will be needed depending on the period of abandonment. Also, a larger portion of variance exist between the initial contract sum and the revised contract sum of abandoned public projects. This is attributable to additional cost from market price fluctuation due to inflation.

Based on the findings of the study, it is recommended that; there should be the creation of a separate escrow bank account by the government or the sponsors of public projects dedicated to financing the project to ensure continuous cash flow. Competent consultants should be engaged to ensure realistic estimate and budgeting. The Government should create policies that will ensure continuity of projects after the exit of initiating government; this is necessary since government is a continuum. In addition, policies against indiscriminate abandonment of project should be enacted and enforced.

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IMPACT OF MONEY ON PRICE DIRECTION OF BUILDING MATERIALS IN ABUJA

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The mechanism for the expansive birthing of developmental infrastructure to service human settlement need is construction. This research evaluates practitioner's insight on money supply and demand for money among other tested macroeconomic indicators as it impacts building materials prices direction in Abuja Nigeria. The study made use of quantitative research technique. Prices of selected building materials obtained from Federation of Construction Industry's quarterly publication. Statistical data on macroeconomic indicators were obtained from the official gazette of the Central Bank of Nigeria and Nigeria Bureau of Statistics. Multiple linear regression analysis was used to establish the relationship between Money Supply and Prices of Building Materials. Result revealed the demand for money with mean item score (MIS) of 4.38 and demand for goods with MIS of 4.94 as the most critical factors causing change in money supply and demand for money respectively. The coefficients of determination (R^2) were very high for the selected building materials. Sandcrete block was the most significant factor with R^2 value of 0.967 (97%) which means that the percentage variation in the prices of building materials could be explained by money supply. While the P –values confirmed that money supply has high negative impact on prices of building materials with cellotex ceiling board value of 0.000 as the highest while demand for money has a statistically negligible impact. The finding will alert practitioners on how money supply causes variation in prices of building materials and assist them in the planning and control of the rising prices of building materials. It will also bring to awareness that demand for money triggers money supply which significantly affect the procurement of building in Nigeria.

Keywords: Money Supply (M1), Demand for Money and Building Materials Prices

INTRODUCTION

Construction is the expansive mechanism for the birthing of development supporting infrastructure in other to meet up human settlement need. This includes the extraction and utilization of materials (raw, semi-processed and finished), and components within construction project cycle which runs from feasibility to the construction stage, the management and operation of the built environment (Ibironke, 2013; TradingEconomics, 2017). Ebekozien (2015) affirmed the industry to be a prime motivator of any economy while in Nigeria; it represents 18 percent of the capital investment. In his study, he revealed a highly positive correlation of 95 percent between Foreign Direct Investment and construction sector which indicates that a unit change in the Foreign Direct Investment inflow into the construction sector will result to 3 percent increase in the construction sector

The World Bank attributed the industry to account for between 3 to 8 percent of the Gross Domestic Product (GDP) in developing countries, Nigeria inclusive. Gross Domestic Product from Construction in Nigeria has a record low of ₦369,190.91 Million in the third quarter of 2010 it reached an all-time high of ₦740,204.22 Million in the second quarter of 2015. From 2010 to 2016 with averaged ₦548,030.67 Million until the third quarter of 2016 when it decreased to ₦543,808.12 Million from ₦693,744.65 Million it was at the second quarter of 2016 (RANK, 2017).

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Cost of construction through a general discovery of studies is affected by huge number of issues fundamentally demand and supply. However, Odediran et al in Isa et al (2013) posited that in Nigerian Construction Industry in the recent past, many projects have been subjected to cost and time overruns. Considering the relationship between construction industry and the national economy, it becomes necessary that the cost of construction be within the reach of the average citizen. Conversely, a few economic indicators are very trivial to the overall cost of construction. Some of which include; money supply, demand for money, inflation rate, interest rate charged on loan and exchange rate of one local currency to other currencies in the world amongst others.

The construction industry in Nigeria has played a significant role over the decades, valued at about $3.15 billion, the industry continues to grow and this is based on the construction knowledge acquired from the British in the 1940s and 1960 (Isa et al., 2013). This growth over the years has a catalytic effect on the economy.

This relationship between the construction industry and the economy of Nigerian nation makes the industry responsive to the economic situation in the country and the economic policies of the government. Thus, when the economy is stable and strong, the construction industry will be highly active since the government and society will have much money to spend and vice versa. Some of the economic factors that could influence construction activities include: exchange rate, inflation rate, international monetary policies etc (Oladipo and Oni, 2012). Majority of the building materials and components incorporated into construction or parts of the material, ingredients required for the manufacture of the materials are sourced from overseas. Local building materials account for a total of 37 percent of materials in the Nigerian market, imported materials stands at 23 and 40 percent for both combined local and imported products. Price differences of up to 3 percent to 15 percent exist between local and imported materials (Anonymous, 2014) and this brings to closer attention the issue of foreign exchange and its inherent problems in construction industry and the need for local sourcing of building materials. It must thus be realized that the danger of reliance on foreign construction materials has significant effect on internal productivity and also kills the desire to develop local alternatives (Oladipo and Oni, 2012).

In the building construction sector, material as an indispensable resource constitute about 60 percent of the total cost of building (Omange and Udegbe, 2000). Many projects were not completed to time due to the cost of materials which have been on the increase perhaps nearly on daily basis. According to Onwioduokit (2000), the International capital flow to a domestic economy are influenced by money supplied, the size of domestic market, capital utilization, debt service ratio, inflation rate, exchange rate, interest rate, government policies, output, credit to the private sector, per capital income, credit rating, world interest rate among others.

In spite of the past studies on the cost of building materials in Nigeria, and much that has been published about the causes, effects and implications of the rise in cost on the construction industry; nearly everyone's literature (Mogbo, 2002; Jagboro and Owoeye, 2004; Njoku, 2007; Mekson, 2008; Oladipo and Oni, 2012; ReseachClue.com, 2015) has concentrated efforts on using distance, exchange rates, interest rates and inflation as parameters of measurement. Base on the foregoing, the significance of cost to construction project success, and the Nigerian government present economic recession which was adjudged a product of lack of adequate economic statistics (TradingEconomics, 2017), hence the need for regular update of economic statistics and the need for accuracy in tender price prediction. In the light of the above, this study intends to give information on the impact of Money Supply and Demand for Money (Macroeconomic Indicators) on the price direction of building materials in Abuja, North Central geo-political zone of Nigeria. This study then is aimed at finding out the impact of macro-economic indicators on prices of building materials.

LITERATURE REVIEW

Money supply

The money supply or money stock is the total amount of monetary assets available in an economy at a specific time. Money supply data are recorded and published, usually by the government or the central bank of the country. Public and private sector analysts have

long monitored changes in money supply because of the belief that it affects the price level, inflation, the exchange rate and the business cycle (TradingEconomics, 2017).

Money supply is the total stock of money circulating in an economy. The circulating money involves the currency, printed notes, money in the deposit accounts and in the form of other liquid assets (Economictimes, 2017). Valuation and analysis of the money supply helps the economist and policy makers to frame the policy or to alter the existing policy of increasing or reducing the supply of money. The economist then periodically publishes the money supply data based on the monetary aggregates set by them. The valuation is important as it ultimately affects the business cycle and thereby affects the economy (Economictimes, 2017).

Aziz (2013) advocated a non-interventionist approach which is targeted as a pre-specified path for the money supply independent of economic conditions of any government. Though in actual practice, this might involve regular intervention with open market operations (or other monetary-policy tools) to keep the money supply on target. This however corroborated the assumption of Charles (2011) that when government buys bonds in an open market operation, this automatically increases the supply of money, it causes the "price" or opportunity cost of holding money to fall.

The relation between money and prices is historically associated with the quantity theory of money. There is strong empirical evidence of a direct relation between money-supply growth and long-term price inflation, at least for rapid increases in the amount of money in the economy. For example, a country such as Zimbabwe which saw extremely rapid increases in its money supply also saw extremely rapid increases in prices (hyperinflation). This is one reason for the reliance on monetary policy as a means of controlling inflation (Ahmed and Suliman, 2011).

Ahmad and Sajad (2011) related the rate of money supply growth to the rate of increase in monetary base. In other words, an increase in the rate of growth of monetary base implies an increase in the rate of volume of money supply. This also indicates that an increase in the rate of money supply results in an increase in the rate of inflation, therefore Money creation cause higher inflation.

Ahmed and Suliman (2011) in their analyses regarding the causal relationship between money supply and prices suggested that the causation runs from money supply to prices, but price level does not cause money supply

Money supply have significant inverse effects on inflationary pressure, while real output growth and foreign price changes have direct effects on inflationary pressure (Akinbobola, 2012). He also stated that the possible justification for the inverse effect of money supply on price level is that inflation may not be due to aggregate demand pressure but rather due to hiccups in the supply chain of goods both from the domestic and foreign supply outlets.

Money supply and change in Interest rate

One of the implications of money demand is that if government wishes to keep the interest rate constant, it must increase the supply of money at the same rate as the increase in nominal Gross Domestic Product. For example, suppose that nominal Gross Domestic Product is growing at a rate of 8 percent per year, consisting of 3 percent real growth and 5 percent inflation. To prevent the interest rate from changing, government must keep the money supply growing by 8 percent per year. If it does this, then both supply and demand are increasing at the same rate so that the equilibrium interest rate is unchanged. If the money supply were to grow faster than 8 percent then the supply curve would be shifting to the right faster than the demand curve, and then the intersection of the two would occur at a lower interest rate. Conversely, if government slowed money growth to below 8 percent, the interest rate would rise. It is seen then, that in a dynamic economy in which output and prices are both changing, the effect of the money supply on the interest rate will depend on the relative growth rates of money and income. Thus, by increasing the supply of money, government can push the interest rate down, and by reducing the supply of money it can push interest rates up (Charles, 2011).

Demand for money

Trading Economics (2017) defined demand for money as the desired holding of financial assets in the form of money: which may be cash or bank deposits. It also refers to the demand

for money narrowly M1 (non-interest-bearing holdings), as a result of trade-off regarding the form in which a person's wealth should be held.

In macroeconomics, motivations for holding one's wealth in the form of money can roughly be divided into the transaction motive and the asset motive. These can be further subdivided into more micro economically founded motivations for holding money.

According to Yandem (2011), demand for money refers to the amount of money people wish to hold or the function determining this. In other words, it is referred to as the desire to hold cash. The demand for money arises from two important functions of money; medium of exchange and the store of value. The study of the demand for money is not restricted to the money market, but also involves other market such as the commodity, capital and foreign exchange market.

Charles (2011) suggested that since holding money is voluntarily, the quantity of money supplied by the government of any nation must be equal to the quantity demanded by money holders. As always, the demand for a good or service depends in part on its price or cost. He also noted that the cost of holding money is an opportunity cost over time, because the alternative is investing those funds to earn interest. What one gets in return for giving up interest income is the liquidity that money provides. Everyone balances the opportunity cost of holding money with the value of that liquidity. He further identified three primary motives for holding money as follows:

- To settle and complete transactions (since money is the medium of exchange).
- As a precautionary store of liquidity, in the event of unexpected need.
- To reduce the riskiness of a portfolio of assets by including some money in the portfolio, since the value of money is very stable compared with that of stocks, bonds, or real estate. These three motives for holding money he referred to as the transactions motive, the precautionary motive, and the portfolio motive respectively.

Demand for Money and change in Interest rate

In general terms, suppose hypothetically, a construction firm XYZ choose to hold ₦1,000 of their ₦50,000 in the form of money that with the interest rate at 20 percent in their cash register or bank account. If the interest rate now drops to 5 percent it shows clearly that the opportunity cost of holding money reduced, there will be increase money holdings and reduction in bond holdings. After all, it now costs the XYZ only 5 kobo per year to hold an extra Naira instead of 20 kobo, while adding to their holdings of money will give them more of the services that holding money provides. As a result of the interest rate falling from 20 percent to 5 percent XYZ might well decide to increase their money holdings, say from ₦1,000 to ₦1,500. XYZ would accomplish increase in their money holdings by selling bonds worth ₦500 and keeping the money they would be paid.

Yandem (2011) posited that the amount of money demanded by the XYZ would change if their income increased. XYZ would demand more money (at a given level of interest rates) primarily because their transactions and precautionary demands would increase at their new higher level of spending. An increase in their wealth would increase their portfolio demand for money. Even an extension or expansion of business horizon could affect their demand for money. For example, a firm which does building and heavy engineering construction will have a greater precautionary demand for money than another firm who does only building. It can then be seen that a firms' demand for money depends on the interest rate, their income, and wealth, among perhaps many other variables. Households are also holders of money, at home, in their wallets and saves, for essentially the same basic reasons as firms (Charles 2011; Yandem, 2011). Adding up the demand for money by all households and firms we have the total demand for money in the economy and that demand will be most importantly a function of the interest rate, income, and wealth in the economy (TradingEconomics, 2017)

The demand for any good or service is usually pictured in economics as a function of its price, holding income and other factors constant. In the case of holding money, the "price" is the opportunity cost of holding one dollar for one year, the interest rate. As this hypothetical demand for money has been drawn, the demand for money is ₦600 billion when the interest rate is 5 percent, but only ₦150 billion when it is 20 percent. This inverse relationship between the interest rate and the demand for money just reflects the fact that

when the opportunity cost of holding money is low, people will want to hold more of it, and when it is high people will want to hold less of it (Yandem, 2011).

The money demand plays a vital role in conducting an influential economic policy since it is considered a critical component of the transmission mechanism of monetary policy. In less developed countries, the stability of money demand is the major concern of policymakers (Bubshait, and AL-Juwairah, 2002). They also pointed out that majority of studies found that the demand for money function is unstable and monetary aggregates lost their influence in the conduct of monetary policy. From monetary view, a stable money demand function is an essential factor in determining the formulation and the conduct of an effective monetary policy which has predictable effects on inflation and real output (Serletis, 2013).

Anonymus (2015) asserted that interest rate tend to change whenever there is a shift in the demand for money. By a shift in the demand for money we mean a change in the quantity demanded at any given interest rate. As already surmised, the demand for money depends on nominal income and wealth. It will also be affected by fluctuations in the volume of transactions of assets. Heavy trading on the stock exchanges or rapid turnover in the real estate market, for example, will both increase the quantity of money demanded simply because these transactions are settled in the medium of exchange, money.

RESEARCH METHOD

In order to achieve the aim of the study, structured questionnaires were administered to respondents (Professionals such as Chartered Economists, Bankers and Quantity Surveyors) to assess money supply among other macroeconomic indicator. Secondary data were collected on prices of selected building materials and money supply over a period of eight (8) years (from 2009 to 2016) from annual official gazette of the Central Bank of Nigeria and Statistical bulletin from Nigeria Bureau of Statistics. Random sampling technique was adopted for this study, a total of 133 questionnaires was administered out of which 53 were returned. This represent 39 percent which is considered adequate for this survey. A five point Likert scale rating were used to elicit respondents' opinion on the importance of the money supply and demand for money. The mean item score (MIS) was used to analyse the respondents' opinions. Multiple linear regression analysis was used also to establish the impact and relationship between the Macroeconomic Indicators and Prices of Building Materials.

RESULTS AND DISCUSSION.

Table 1 shows the respondents' assessment of the effect of the macro – economic indicators on the prices of building materials, the rating which fell within 4.96 for import and 1.92 for external debt service. The five most significant indicators are import, change in pump prices of petroleum products, money supply, demand for money and inflation. This corroborated the view of Arayela (2002) that the modern building industry lays much emphasis on the procurement of sophisticated building materials and techniques that are expensive and energy consuming. In so doing investment is heavily in the importation of these ever-dynamic materials.

Table 1. Macro-Economic Indicators Affecting Prices of Building Materials

Indicators	Mean	Rank
Import	4.96	1
Change in pump prices of petroleum products	4.94	2
Money supply	4.88	3
Demand for money	4.88	3
Inflation	4.76	5
Exchange rate	4.73	6
Interest rate	4.67	7
Export	4.67	7
Gross domestic product	3.96	9
Growth of credit	3.96	9
Unemployment	2.73	11
External reserve	2.65	12
External debt service	1.92	13

Table 2 illustrates the respondents rating of the factors that cause change in demand for money. It fell between 4.94 (demand for goods) and 1.53 (turnover in real estate). The factors identified are all critical but the most critical of them are demand for goods, high level of importation, supply of petroleum products, changes in the quantity of money in circulation and change in nominal income.

Table 2 Factors Causing Change in Demand for Money

Factors	Mean	Rank
Demand for goods	4.94	1
High level of importation	4.88	2
Supply of petroleum products	4.80	3
Change in the quantity of money in circulation	4.76	4
Change in nominal income	4.75	5
Lending interest rate	4.66	6
Trade liberalization	4.62	7
Level of technology	4.30	8
Changes in taste	4.15	9
Supply of goods	4.15	9
Market monopoly	4.08	11
Labour productivity	3.96	12
Change in the prices of substitutes	3.92	13
Import tariff	3.92	13
Deregulation of the economy	3.90	15
Variation in the naira value	3.88	16
Level of industrialization	3.82	17
Oil subsidies	3.80	18
Industrial capacity utilization	3.75	19
Trade restriction	3.37	20
Fluctuation in the volume of transaction assets	3.27	21
Salaries and wages	3.26	22
Heavy trading on the stock exchange	3.20	23
Taxation policy	2.94	24
Downsizing of labour force	2.90	25
Political climate	2.80	26
Per capital income	2.67	27
Bal of payment	2.25	28
Debt servicing	2.25	28
Turnover in real estate market	1.53	30

Source: Author's field result (2017)

In Table 3, the respondents rating of the factors that cause changes in money supply fell between 4.86 for demand for money and 1.00 for rediscount rate. The most critical factor causing change in money supply are rated as demand for money, value of money in circulation, foreign exchange rate, Deregulation of interest rate and level of foreign exchange. This consisted with the suggestion of Charles (2011) that the quantity of money supplied by the government of any nation must be equal to the quantity demanded by money holders. This is due to the fact that the most critical of all factor is demand for money. He further stated that by increasing the supply of money, government can push the interest rate down, and by reducing the supply of money it can push interest rates up.

Table 3 Factors Causing Change in Money Supply

Factors	Mean	Rank
Demand for money	4.86	1
Volume of money in circulation	4.76	2
Foreign exchange rate	4.61	3
Deregulation of interest rate	4.57	4
Level of foreign exchange	4.00	5
Credit constraints	3.88	6
Government economic policies	3.84	7
Level of investment	3.84	7
Change in government	3.80	9
Change in national income	3.57	10
Size of domestic market	3.09	11
Per capital income	2.94	12
Stock exchange	2.90	13
Inflation	2.88	14

Minimum rediscount rate	2.01	15
Salaries and wages	2.00	16
Rediscount rate	1.00	17

Source: Author's field result (2017)

In Table 4. The coefficient of determination (R^2), which is widely accepted as an indication of how well a model fits the population as opined by Chan (1999), was very high. The coefficients of determination are 97 percent for timber, 95 percent for Sandcrete block; Ceramic tiles; granite and texcote paint, 94 percent for reinforcement and sharp sand, 92 percent for cellotex ceiling board and cement while 91 percent is for single core electric cable. This implies that these percentages of the variation in the prices of selected building materials could be explained by money supply and demand for money. This confirmed the opinion of Oladipo and Oni (2012) that for every change in macroeconomic indicators; there is the likelihood that prices of building materials will change.

Table 4. Summary of Regression Showing the Relationship between Prices of Materials (Dependent Variables and Macroeconomic Indicators (Independent Variables)

VARIABLES	A	b_1(Money SS) X_1	b_2(Money DD) X_2	R	R^2	F
Sandcrete Block	126.352	0.006	-0.011	0.983	0.967	87.874
Timber	728.501	0.064	-0.043	0.982	0.964	81.398
Cellotex Ceiling Board	6792.712	0.597	-1.796	0.974	0.948	55.244
Texcote Paint	-3994.235	2.641	-2.805	0.972	0.944	50.715
Granite	843.224	0.210	-0.383	0.970	0.940	29.901
Sharp sand	645.892	0.082	-0.132	0.962	0.926	39.6100
Single Core Electric Cable	1866.985	0.338	-0.735	0.948	0.899	26.810
Ceramic Tiles	2436.624	0.641	-1.451	0.914	0.835	15.168
Cement	541.508	0.054	0.212	0.913	0.834	15.019
Reinforcement	97068.657	26.542	-53.025	0.901	0.812	12.984

Source: Author's field result (2017)

Table 5a showed the validation of the extent of money supply and demand for money on determination of the prices direction of the selected building materials. It confirmed further from the P –values that money supply impacted sharp sand, granite, sandcrete block, timber, cellotex ceiling board, single core electric cable, texcote paint and ceramic tiles.

While demand for money had a significant effect on cellotex ceiling board and ceramic tiles only.

Table 5a. Summary of t-Statistics

Variables	**Money Supply**		**Demand for Money**	
	t_{-stat}	**sign**	**t_{-stat}**	**sign**
Cement	0.679	0.563	0.696	0.513
Sharp sand	3.567	0.012	-1.484	0.188
Granite	4.366	0.005	-2.067	0.084
Sandcrete block	5.612	0.001	-2.446	0.050
Reinforcement	2.464	0.049	-1.277	0.249
Timber	3.815	0.009	-0.665	0.531
Cellotex ceiling board	8.378	0.000	-6.535	0.001
Single core electric cable	3.838	0.009	-2.166	0.074
Texcote paint	3.404	0.014	-0.938	0.385
Ceramic tiles	3.010	0.024	-1.767	0.128

Source: Author's field result (2017)

Table 5b. illustrates the respondent's assessment of the impact of the macro-economic indicators on prices of building materials. The rating generally is 3 for High impact, 2 for Low impact and 1 for No impact. The ones with critical impact on prices of building materials are money supply, change in pump price of petroleum product, import, demand for money, and interest rate. Though inflation impacts the prices of building materials, its impact is rated as not so critical in prices of materials.

Table 5b: Impact of macro-economic indicators on prices of building materials

Indicators	Mean	Rank
Money supply	2.98	1
Change in pump prices of petroleum products	2.94	2
Import	2.92	3
Demand for money	2.84	4
Interest rate	2.73	5
Exchange rate	2.69	6
Gross domestic product	2.12	7
Inflation	1.92	9
External reserve	1.88	9
Growth of credit	1.83	10
External debt service	1.61	11
Unemployment	1.11	12
Export	1.04	13

Source: Author's field result (2017)

In all, the respondent's rating and statistical significance on the assessment of impact of macroeconomic indicators on price direction of building materials, money supply had higher level of impact on greater percentage of the materials under study. This is because there is strong empirical evidence of a direct relation between money supply growth and long-term price inflation. Therefore, building materials and components incorporated into construction or parts of the material ingredients required for the manufacture of the materials are impacted upon by money supply policies (increase or decrease in volume or money supply) as money creation causes higher inflation. This buttresses the suggestion of Ahmed and Suliman (2011) in their study of causal relationship between money supply and prices that the causation runs from money supply to prices, but price level does not cause money supply.

CONCLUSION

From the results of this study, it can be concluded that: money supply is the most critical macroeconomic indicator influencing prices of building materials while demand for money is less critical despite been assessed as the most critical factor causing money supply and its most affected on its own by demand for goods. Therefore, prices of building materials required for the manufacture of the materials are responsive to any (slight upward) change in the money supply. Any variation also in demand for money (either slight or major) as a factor has statistically negligible impact as touching price direction therefore money supply is the macroeconomic indicator that has direct impact on price direction of building materials in Abuja, Nigeria.

RECOMMENDATIONS

This study had shown how money supply and demand for money impacts on the prices of the selected building materials. It is therefore suggested that Government should maintain money supplied into the economy to neutralize interest rate in Nigeria, reduce import duties charged on materials used in the building industry. This will have positive effect on the prices of building materials in that it will encourage procurement of building and finally encourage increase in quality local production and encourage/enforce patronage to meet up to demand for goods (building materials) in Nigeria.

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DEVELOPING BUILDING COST INDICES USING FEDERAL HIGH COURT PROJECTS OF 2007 TO 2016

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Studies over the past twenty years revealed a trend of rising cost of construction input resources globally, and this trend is expected to continue because the factors responsible remained unchanged. This attracts a great deal of concern to both private and public bodies involved in the construction industry. This necessitates a study of developing building cost indices (BCI) using Federal High Courts (FHC) prototype building in Nigeria as a case study. In order to achieve the aim of the study, the research adopted a quantitative research approach. Archival data were collected for building materials price data published every quarter of the year by Federation of Construction Industry (FOCI) for Abuja from 2007 to 2016. Building Construction Indices (BCI) for FHC buildings were developed using Laspeyres Index formula and tested for its validity. The study revealed that the BCI for the prototype FHC has increased steadily from 1.00 to 1.50 points on the average within the period of Nine (9) years from 2007 to 2016. The validation of the index figures shows a range of between -5% and +11.1% which is within the acceptable limit for estimation. The study recommended that building materials and plant hiring rates database management should be taken seriously and be handled by experts. It was also suggested that National labour rates published by FOCI should take cognizance of regional differences in cost of living in order to provide realistic reflection of the States Index numbers and eventually will lead to a more robust National BCI.

Keywords: *Building Cost, Indices and Factors.*

INTRODUCTION

Studies over the past twenty years revealed a trend of rising cost of construction input resources globally, and this trend is expected to continue because the factors responsible remained unchanged (Osei, 2008). This attracts a great deal of concern to both private and public bodies involved in the construction industry. The rapid increase in cost of construction is observed to be influenced by various factors (Shittu *et al*., 2013). Globally, these factors include market conditions, project complexity, and availability of materials, cost of raw materials, and cost of labour, petroleum products, competition, risk, contractors' pricing and mark-up allocation strategy (Rizwan *et al*., 2016). In Nigeria, increase in price of petroleum product leads to fluctuation in materials prices (Shittu *et al*., 2015), upward labour wages reviews at intervals by National Joint Industrial Council (NJIC) contributes to the increase in the cost of building construction in Nigeria. Macroeconomic indicators such as unemployment rate, exchange rate, inflation rate, capacity utilization, external debt and price stability, are systematic risk component of the economy which contributed to this high inflation rates (Asaolu and Ogunmakinwa, 2011). The micro and macroeconomic influences lead to the increase in inflation rates from average 11% to 18% between January and December 2016 as published by National Bureau of Statistic (NBS), This endemic high inflation rate remains a concern to all including government despite various policies to combat it. The combination of above factors contributed to annual changes that occurred in building cost increases year on year; these changes occurred for a variety of reasons (Ashworth, 2010).

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Hence, the necessity to collect cost Data over the time which is to be converted to current date or appropriate future timescale; this is achieved through theoretical and practical means of index numbers. These index numbers which are presented in different forms such as Building cost index and tender price index are used in comparing prices, production, employment or population changes over a certain period of time (Ashworth, 2010).

From the available literature, building cost indices or tender prices indices produced in Nigeria are limited in scope considering the variations in geographical and climatic conditions. In a related study, Ibrahim *et al.* (2015) focused on the building cost indices for Millennium Development Goal (MDG) projects in Kaduna State. Consol's Nigerian Mechanical and Engineering Services Price Book (2015) outlined tender price indices between 1999 and 2012. Olurunsola *et al*. (2013) focused on price indices for residential properties for Nigeria. Olagunju *et al*. (2014), in a related study, focused on comparing price index of house rents in different locations in Ilorin metropolis with price of selected building materials.

None of the above-mentioned publications develop Building Cost Indices on a wider scale across geographical landscape in Nigeria. In view of the above, the study set out to develop building cost indices for Federal High Courts in Nigeria. The following objectives were pursued in order to achieve the aim of the study:

i. To identify the indicator items from the BOQ and establish their base year quantities.
ii. To determine the summative unit rates for indicator items for each year of the study period
iii. To develop the BCI for FHC building

Basic Concepts of Indices

A variety of index numbers are used in different circumstances to ascertain price changes happening in an economy. These are in the form of consumer price indices (CPIs) related to specific goods or services such as producer price indices (PPIs) and GDP deflators. Consumer price index (CPIs) are designed to measure changes over a period of time using average retail prices of a fixed "basket of goods" or indicator items and other services taken as representing the household consumption habits in a nation or a particular geographical location. PPIs determine average movements of prices collected by the commodities producers. The PPIs standards take cognizant of delivery cost only and exclude taxes and mark-ups. PPIs scope varies depending on the country, they are generally determined on the basis of the total income of established industries such as industrial, agronomy, or mining. In general terms, construction price indices computes changes in the prices of either the inputs to, or outputs of, commodities required in construction works.

In the absence of specific Index for construction sector, the CPI issued to calculate the longitudinal inflation values determination of an economy, Eshaf (2012) reported the use of consumer price index (CPI) as a substitution index for construction deflator. CPI provides a yardstick for relating inflation in the indices that represents price changes in water main and sanitary sewer standard components and reference projects as constructed by Rizwan *et al*. (2016). To proceed, annual Total CPI data spanning from period 1984–2010 produced by the Bank in Canada was used as a proxy for general inflation.

As with both CPIs and PPIs, the development of price indices for construction activity is a complex process containing a long and diverse set of operations. The expediency of the construction indices compilation also depends on identifying clearly thoughtful purposes of the indices, and the features of the construction industry in particular (Kinkannon and Franchet, 1997). These features include:

- The processes of construction activities undertaken throughout the country.
- Construction methods commonly used for each type of construction activity, together with an idea of the rate of change in techniques used.
- Types of construction companies involved in construction activity, and their composition.
- Management arrangements for the maintenance of building/construction codes.
- Development control department authorisation of individual proposed construction projects.

Analysis of Unit Rates

This is the process of computation of unit rates of a particular item of work, following its specification, from the cost of materials, the cost of labour and other miscellaneous petty expenses required for its completion. The analysis of rates of any item of work depends on the following:

i. Specification of different items of work and materials.

ii. Quantities of materials and their rates, number of different types of labour (both skilled and unskilled) as per standard and their rates.

iii. Location of site, means of communication, distance of site from source of materials and cost of transportation.

iv. Availability of tools and plants, different types of equipment required for different operations as per specification.

v. Profit and overhead charges.

Factors Required for Building up Unit Rates

Duromola (2014) explained the cost of materials, labour, plant (equipment), overhead and profit as components of Units Rates. The total cost of materials often referred to as all-in-material rate is the real cost of material plus money expended on incidental costs like delivery to site (transportation), unloading and stacking. Material component for each operation should be separately listed in the correct quantities and according to their classifications and unit cost. Unit cost of each material should be obtained from reliable source for the efficiency of cost of material requirement for the project. Delivery cost of each material should be included. The quantities of material required for each operation or combination of operations are calculated.

The all-in-labour rate is the total cost of labour and this combines direct labour cost and indirect labour cost. Cost of labour depends on the location. Though, the minimum basic rate is the NJIC agreement on wages and fringe benefits for workers in the industry. Most serious contractors pay above this level to sustain and retain experienced workers. Conventionally, each operation (item of work in BOQ) is considered on its labour requirements in relation to hourly or daily production rate of works as determined by the contractor. Labour is classified according to the work performed and wages received. The total amount of time required for each labour classification is estimated.

The all-in-plant rate is the direct cost of purchase plus the operating cost that all-in-plant rate will only include the rental cost plus some incidental cost like fuelling, oiling, but excluding the maintenance cost. Depending on the nature of construction, equipment takes largest proportion of cost estimates in civil engineering projects unlike the building works where materials and labour takes the largest proportion. The choice to Own or Hire equipment is made taking into cognizant the available capital, amount of work calling for machinery and work for plant through hire business.

Overhead is the cost to the contractor for running the business. We have project (site) overhead and general overhead. Project overhead is the total cost of items that cannot be satisfactorily distributed among the unit rates expended directly on the project. General overhead are those costs expended by the company in keeping the organization going when executing a particular project. It can be calculated from the previous financial years account and expressed as a percentage of the turnover for that year. This percentage can be used to calculate the approximate overhead charges in estimate for future contract. Examples are the office rent, salaries, furniture and fixes, bank charges, communication and stationery.

RESEARCH METHODOLOGY

This section details the procedure adopted in developing Building Cost Indices. A case of Federal High Court (FHC) building, Abuja was used for this study to develop Building Cost Indices (BCI). The building was fully measured and priced as at 2007 chosen as a base year. The effect of price changes in materials, labour and plant is computed and reflected in unit rates through to year 2016 to generate BCI with the aid of a suitable cost indices formula. Abuja is selected for this research and subsequently a national average is established. The

choice of Federal High Court building was based on the fact that homogenous design and continuous price data available for this study.

The base year of 2007 selected for this study satisfied two out of three criteria outlined by Al-Helali (1996). First, the periods during which there were troughs or peaks of price fluctuation; Secondly, the base period should not be too far from the present and the third consideration is to choose the same base year as other indexes, to facilitate easy comparison of the results. The second and third consideration is applicable to this research as it coincides with the period of research conducted by Ibrahim *et al*. (2015) and availability of publications by New Comprehensive construction cost book (NCCCB, 2008) and Federation of Construction Industry (FOCI, 2007). Also, the nine years is considered not too far.

There are basically two ways of selecting weight, namely: fixed quantity and variable quantity. The variable quantity approach, which uses both base year quantities and current year quantities, was the most appropriate for this research because it satisfied mathematical criteria of both the time reversal and the factor reversal tests. Although the Ideal Index is theoretically an excellent index, the requirement to update quantity weight makes it difficult to use for a general-purpose index. This method also has the advantage of comparison between indexes. Another advantage is that the tabulation of quantities will be done taking into consideration both the base year and current year quantities. The base year and current year quantities for all selected items in the price index are used as weights in this research.

Identification and selection of Price Index Items was achieved by review of the Bills of Quantities (BOQ) for the prototype building for the FHC. Indicator items were selected from the BOQ on the basis that all trades in the BOQ are represented and that the items should have a significant value relative to the entire building cost.

After applying the above two conditions, twenty five (25) indicator items emerged. The items selected are found in a typical average office building construction in Nigeria within the period under review. Basic prices of materials, labour and plants sourced through secondary means for Abuja from 2007 to 2016. The Bills of Quantities and necessary designs were obtained from a Consultant Quantity surveyor involved in one of the State projects. The data sources include:

i. The National Joint Industrial Council (NJIC) and National Union of Civil Engineering Construction, Furniture & Wood workers (NUCECFWW) for Labour wages.
ii. Federation of Construction Industry (FOCI) schedule of materials prices for builders' work for four Nigerian Cities, Schedules of day works for Plant hiring rates.
iii. Consol's for Electrical and Mechanical services materials price books.
iv. Nigerian Institute of Quantity Surveyors (NIQS) Journals.
v. New Comprehensive Construction Cost Book (NCCCB) and
vi. Cosines Building and engineering price book.

Building materials data sourced from FOCI were found to be deficient in updated prices and combinations of other sources were used to arrive at current prices of the study period. The quantities (base weight) are extracted from the BOQ of typical outstation offices of FHC. The prices for each item in the 'basket of goods' from 2007 to 2016 was updated annually through schedule of materials prices, labour rates and plant hire rates calculated by 'Vector 8' (a professional quantity surveying software). Plate I, illustrate calculation of unit rate for a concrete work (mark-ups exclusive) as at 2007 for Abuja.

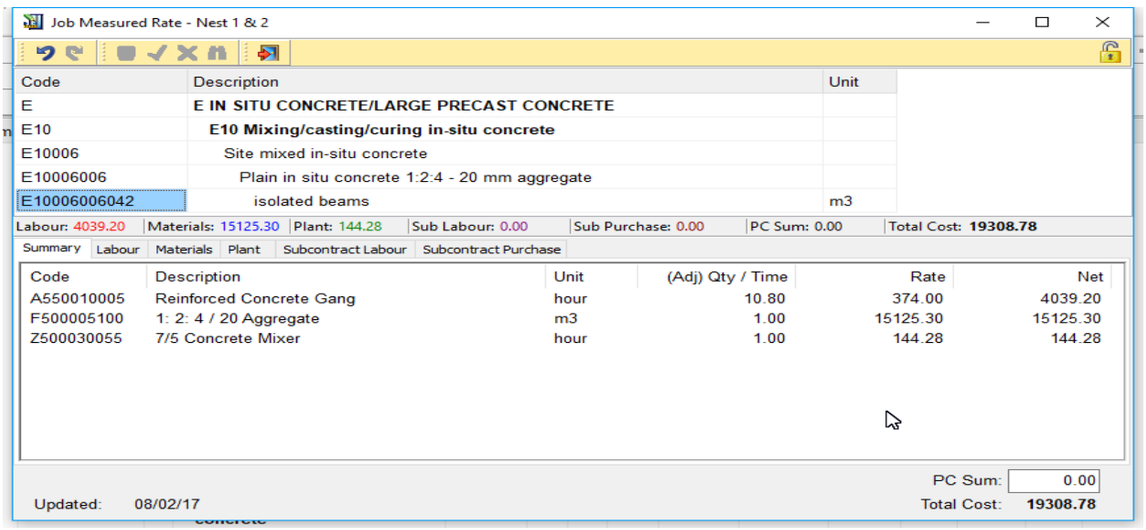

Plate I. Concrete works unit rate calculation

The formula suitable for this research is the Laspeyres index which assumes that people are still buying now the quantities they bought in the base year. Hence, this is commonly called base-weighted price index, this is represented as follows:

$$\text{Base weighted price index} = \frac{\text{Total cost of base - year quantities at current prices}}{\text{Total cost of base -year quantities at base-year prices}}$$

That is:

$$\text{Base-weighted price index} = \frac{\Sigma q_0 p_n}{\Sigma q_0 p_0} \quad \text{Equation (1)}$$

Where:
q_0 = the quantity for the base year
q_n = the quantity for the given year
$\mathbb{P}n$ = the sum of the given year prices
$\mathbb{P}o$ = the sum of the base year prices

Developed price index was tested for its validity. This was achieved by comparing the updated cost information with current priced total cost. The actual price in 2007 was multiplied by index number for 2016 to arrive at predicted price. The predicted price for 2016 was then compared with actual price for 2016 and their differences computed. The difference should be within acceptable limit of 5% (Ibrahim *et al*., 2015).

RESULTS AND DISCUSSION

The Development of BCI

The objectives 1 and 2 were addressed in table 4.1, this table consist of 25 (twenty-five) indicator items and base year quantities extracted from the BOQ (Objective 1), the unit rate for the base year is multiply by base year quantities to arrive at the total (summative) for each year (objective 2) from 2007 to 2016. Each corresponding year have an updated unit price (pn) multiply by the constant base year quantities. The summative total amount are used in calculation of BCI with the aid Laspeyres index formula

Building Cost Index Indicator Items Calculations (2007-2016)

The unit rate summative tables consist of twenty five indicator items, each indicator items have it base year quantities (qo) as a representation of the Bill of Quantities. The unit rates for each indicator items were calculated with the aid of a computer software (Vector for professional Quantity Surveyors in plate 1). The estimating process involved the input of the prices for the materials, labour wages and plant hire rates required for each output to generate the unit rates (po), profit and overhead exclusive. The product of (qo) and (po) give the total amount required for each unit of indicator items (qopo). These products are calculated for each study year (2007 – 2016). The updated unit rates (pn) were done through prices obtained from published sources which are in turn inputted repeatedly throughout the study years. Summative of each study year (2007 to 2016) were obtained, this represent total project cost. The range of the project cost was between N100,372,028.40 to N153,457,752.22, these total project cost data are inputted into the Laspeyres Index Formula to obtained BCI throughout the study years.

Table 4.1 Unit Rates Summative for Abuja

S/n	Descriptions	qo	Unit	Year 2007		Year 2008		Year 2009		Year 2010	
				po	qopo	pn	qopn	pn	qopn	pn	qopn
1	Plain in situ concrete 1:2:4 - 20 mm aggregate	576	m3	19308.78	11,121,857.28	16200.78	9,331,649.28	19067.78	10,983,041.28	21485.49	12,375,642.24
2	Sawn softwood, basic finish attached to walls	4996	m2	1890.71	9,445,987.16	1898.39	9,484,356.44	1901.15	9,498,145.40	2169.34	10,838,022.64
3	Reinforcement for in situ concrete; 12 mm	120.54	tonne	122795.10	14,801,721.35	180545.10	21,762,906.35	159677.10	19,247,477.63	167718.30	20,216,763.88
4	Sandcrete Block in gauged mortar 1:6 walls; 230 mm	3607	m2	2166.79	7,815,611.53	2000.59	7,216,128.13	2478.19	8,938,831.33	2371.74	8,554,866.18
5	75x75x6mm angle iron Rafters less than 40kg/m	9.50	tonne	124589.02	1,183,595.69	204929.02	1,946,825.69	219705.02	2,087,197.69	261914.89	2,488,191.46
6	0.55 mm Aluminium roof coverings	745	m2	1902.11	1,417,071.95	1902.11	1,417,071.95	2020.91	1,505,577.95	2339.54	1,742,957.30
7	Perforated Suspended Acoustic Ceiling panels	1236	m2	3172.50	3,921,210.00	3172.50	3,921,210.00	3172.50	3,921,210.00	3172.50	3,921,210.00
8	AluminiumWindows size 1800x1200mm high	22	nr	45760.00	1,006,720.00	45760.00	1,006,720.00	45760.00	1,006,720.00	45760.00	1,006,720.00
9	Flush door; hardwood lipped on long edges	27	nr	11314.15	305,482.05	11314.15	305,482.05	11314.15	305,482.05	11669.15	315,067.05
10	Surface Finishes; Cement and sand, 38 mm thick	2621	m2	844.39	2,213,146.19	724.54	1,899,019.34	837.34	2,194,668.14	851.23	2,231,073.83
11	13 mm screeded backings; over 300 mm wide	8539	m2	423.68	3,617,803.52	383.73	3,276,670.47	421.33	3,597,736.87	460.92	3,935,795.88
12	200 x 200 x 4 mm Mosaic wall tiling ; over 300 mm wi	2971	m2	3572.40	10,613,600.40	3572.40	10,613,600.40	3572.40	10,613,600.40	3652.57	10,851,785.47
13	600x300x12mm thick granite tiles over 300 mm wide	1270	m2	11289.00	14,337,030.00	11289.00	14,337,030.00	11289.00	14,337,030.00	11289.00	14,337,030.00
14	Painting; smooth plaster	5120	m2	205.84	1,053,900.80	205.84	1,053,900.80	205.84	1,053,900.80	222.88	1,141,145.60
15	Wash Hand Basin	19	nr	14836.00	281,884.00	14836.00	281,884.00	14836.00	281,884.00	14836.00	281,884.00
16	Water Closet	19	nr	16920.00	321,480.00	16920.00	321,480.00	16920.00	321,480.00	16920.00	321,480.00
17	Kerbs; 300 x 100mm	1144	m	1935.25	2,213,926.00	1935.25	2,213,926.00	1935.25	2,213,926.00	1935.25	2,213,926.00
18	65 mm half bond Interlocking pavements	4057	m2	1978.63	8,027,301.91	1978.63	8,027,301.91	1978.63	8,027,301.91	2148.03	8,714,557.71
19	Cold Water pipes; 20 mm	434	m	538.47	233,695.98	538.47	233,695.98	538.44	233,682.96	658.35	285,723.90
20	2.5 HP floor mounted split air conditioner	35	nr	125216.00	4,382,560.00	130216.00	4,557,560.00	130216.00	4,557,560.00	130216.00	4,557,560.00
21	100A, 8 way Distrubution Board	2	nr	50072.00	100,144.00	50072.00	100,144.00	50072.00	100,144.00	50072.00	100,144.00
22	2.5mm2 single core cable	1800	m	147.27	265,086.00	153.95	277,110.00	168.61	303,498.00	188.41	339,138.00
23	4x50mm pvc/swa/pvc cable	200	m	5760.00	1,152,000.00	6560.00	1,312,000.00	6560.00	1,312,000.00	13510.00	2,702,000.00
24	Single lighting points controlled by one switch	57	nr	1756.27	100,107.39	1857.23	105,862.11	2044.26	116,522.82	2138.69	121,905.33
25	Twin, batten type with prismatic controller;600 mm	120	nr	3659.21	439,105.20	3659.21	439,105.20	3659.21	439,105.20	4598.26	551,791.20
				Total	**100,372,028.40**	**Total**	**105,442,640.10**	**Total**	**107,197,724.43**	**Total**	**114,146,381.67**

Source: Researcher's Analysis (2017)

Table 4.1 Unit Rates Summative for Abuja (continued)

Year 2011		Year 2012		Year 2013		Year 2014		Year 2015		Year 2016	
pn	qopn	pn	qopn	pn	qopn	pn	qopn	pn	qopn	pn	qopn
22353.49	12,875,610.24	25106.49	14,461,338.24	24475.99	14,098,170.24	25303.99	14,575,098.24	28241.81	16,267,282.56	31398.68	18,085,639.68
2168.14	10,832,027.44	2576.97	12,874,542.12	2576.97	12,874,542.12	2578.17	12,880,537.32	2753.08	13,754,387.68	3056.01	15,267,825.96
178882.50	21,562,496.55	187329.30	22,580,673.82	192579.30	23,213,508.82	192583.50	23,214,015.09	215371.50	25,960,880.61	222476.70	26,817,341.42
2289.90	8,259,669.30	2641.00	9,526,087.00	2623.38	9,462,531.66	2659.96	9,594,475.72	2822.63	10,181,226.41	3051.67	11,007,373.69
261914.89	2,488,191.46	278754.22	2,648,165.09	268454.22	2,550,315.09	268454.22	2,550,315.09	271327.46	2,577,610.87	272881.65	2,592,375.68
2015.54	1,501,577.30	2087.54	1,555,217.30	3178.34	2,367,863.30	2087.54	1,555,217.30	3501.34	2,608,498.30	4060.34	3,024,953.30
3172.50	3,921,210.00	4172.50	5,157,210.00	4172.50	5,157,210.00	4172.50	5,157,210.00	4172.50	5,157,210.00	4172.50	5,157,210.00
45760.00	1,006,720.00	45760.00	1,006,720.00	45760.00	1,006,720.00	55760.00	1,226,720.00	60760.00	1,336,720.00	62760.00	1,380,720.00
12281.15	331,591.05	15001.15	405,031.05	15001.15	405,031.05	18806.15	507,766.05	19101.15	515,731.05	19466.15	525,586.05
890.71	2,334,550.91	1004.61	2,633,082.81	966.30	2,532,672.30	1023.57	2,682,776.97	1103.98	2,893,531.58	1252.41	3,282,566.61
474.08	4,048,169.12	559.92	4,781,156.88	547.15	4,672,113.85	566.24	4,835,123.36	595.52	5,085,145.28	682.14	5,824,793.46
3652.57	10,851,785.47	4231.20	12,570,895.20	4231.20	12,570,895.20	4231.20	12,570,895.20	5152.86	15,309,147.06	5237.61	15,560,939.31
11289.00	14,337,030.00	11289.00	14,337,030.00	11289.00	14,337,030.00	11289.00	14,337,030.00	11289.00	14,337,030.00	12289.00	15,607,030.00
252.88	1,294,745.60	270.16	1,383,219.20	270.16	1,383,219.20	291.16	1,490,739.20	297.92	1,525,350.40	315.44	1,615,052.80
14836.00	281,884.00	14836.00	281,884.00	14836.00	281,884.00	14836.00	281,884.00	14836.00	281,884.00	19336.00	367,384.00
16920.00	321,480.00	16920.00	321,480.00	16920.00	321,480.00	16920.00	321,480.00	16920.00	321,480.00	22420.00	425,980.00
2135.25	2,442,726.00	2135.25	2,442,726.00	2135.25	2,442,726.00	2135.25	2,442,726.00	2135.25	2,442,726.00	2135.25	2,442,726.00
2148.03	8,714,557.71	2663.63	10,806,346.91	2691.13	10,917,914.41	2966.13	12,033,589.41	2981.63	12,096,472.91	3341.28	13,555,572.96
680.42	295,302.28	853.04	370,219.36	1096.14	475,724.76	1361.14	590,734.76	1570.93	681,783.62	1586.26	688,436.84
130216.00	4,557,560.00	135216.00	4,732,560.00	135216.00	4,732,560.00	135216.00	4,732,560.00	185216.00	6,482,560.00	205216.00	7,182,560.00
50072.00	100,144.00	50072.00	100,144.00	50072.00	100,144.00	50072.00	100,144.00	50072.00	100,144.00	50072.00	100,144.00
188.41	339,138.00	217.21	390,978.00	217.21	390,978.00	217.21	390,978.00	230.21	414,378.00	251.21	452,178.00
13510.00	2,702,000.00	7830.00	1,566,000.00	8810.00	1,762,000.00	8810.00	1,762,000.00	8810.00	1,762,000.00	8810.00	1,762,000.00
2285.69	130,284.33	2381.45	135,742.65	2381.45	135,742.65	2381.45	135,742.65	2656.35	151,411.95	2773.11	158,067.27
4598.26	551,791.20	4637.86	556,543.20	4637.86	556,543.20	4637.86	556,543.20	4737.86	568,543.20	4777.46	573,295.20
Total	**116,082,241.96**	**Total**	**127,624,992.83**	**Total**	**128,749,519.85**	**Total**	**130,526,301.56**	**Total**	**142,813,135.48**	**Total**	**153,457,752.22**

Source: Researcher's Analysis (2017)

BCI Calculations for Abuja

This table consist of summative total for years 2007 to 2016. The ∑qoℙo is the Base year total for Abuja while ∑qoℙn is the Subsequent study years total for 2008 to 2016. The base year total and subsequent years totals are inputted into Laspeyres Index Formula to established BCI for Abuja. The cost of the building rose by 53% between 2007 and 2016. The highest year on year index difference occurred in 2012 at 9.94%, followed by 2015 at 9.41% and 2016 at 7.45%. the lowest year on year price difference was in 2013 with 0.88% price increase. The average building cost over the study period was N122,641,271.85 which represent 22% over the base year. The average year on year increase was 4.40%.

Table 4.2: BCIfor Abuja

years	∑qoℙo	∑qoℙn	Laspeyres index (%) = ∑qoℙn/∑qoℙo	Year on Year difference (%)
2007	100,372,028.40	100,372,028.40	1.00	0
2008	100,372,028.40	105,442,640.10	1.05	5.05
2009	100,372,028.40	107,197,724.43	1.07	1.66
2010	100,372,028.40	114,146,381.67	1.14	6.48
2011	100,372,028.40	116,082,241.96	1.16	1.70
2012	100,372,028.40	127,624,992.83	1.27	9.94
2013	100,372,028.40	128,749,519.85	1.28	0.88
2014	100,372,028.40	130,526,301.56	1.30	1.38
2015	100,372,028.40	142,813,135.48	1.42	9.41
2016	100,372,028.40	153,457,752.22	1.53	7.45
Average	100,372,028.40	122,641,271.85	1.22	4.40

Source: Researcher's Analysis (2017)

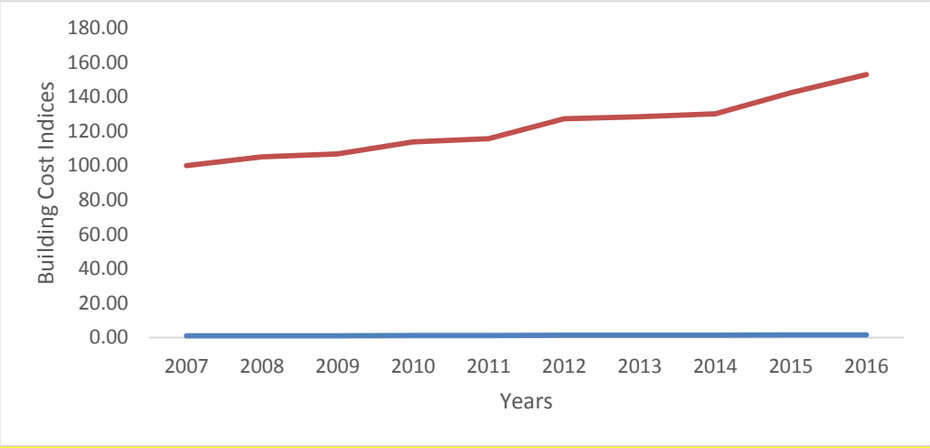

Figure 4.1 Graph of the BCI for FHC Abuja.

Validation of BCI

Table 4.30 shows validation of predicted prices and actual prices at a future time, the predicted prices being total sum obtained from extrapolated prices from 2007 to 2016 while the Actual prices are the prices obtained from the input of current market realities. The 2007 actual building prices at Abuja was extrapolated to year 2016 using the Index numbers generated by BCI, the predicted figure N641,285,714.32 compared to actual price in 2016 of N605,844,828.75. This gave difference of 5.85% as shown on table 4.30. This difference could be adjudged to be within acceptable estimation level (Oberlender, 1993; Harbuck, 2002).

Table 4.30 Comparison between the indexes values and the validation prices

Location	Actual prices in 2007	Index number for 2016 (i%)	Predicted prices for 2016 (x2016%)	Actual prices in 2016 (N)	Difference between predicted and actual prices (%)
Abuja	419,140,989.75	153	641,285,714.32	605,844,828.75	5.85

Source: Researcher's Analysis (2017)

CONCLUSION AND RECOMMENDATIONS

Conclusion

The study provided BCI for use by organisations with nationwide offices such as the FHC, CBN, FIRS, Federal Secretariats, FMBN, Corporate Affairs Commission, National Primary Health Care Development Agency and Private Organisations. Also, the study established LAF for four States using Abuja as a base city to provide an opportunity guide for such organisations who intends to establish branch offices in other locations. The conclusions therefore are;

i. Twenty five (25) indicator items/basket of goods were selected from the Bills of Quantities for the prototype buildings of the FHC. These are items of work with cost significance from the Bills of Quantities.

ii. The BCI for the prototype FHC has increased steadily from 1.00 to 1.50 points on the average within the period of Nine (9) years from 2007 to 2016, and the year on year average percentage differences indicated that 2012 has the highest increase of 9.48% followed by 2016 with 7.14% increase and 2015 with 6.87% increase. In the same vein, the validation of the index figures shows a range of between -5% & to +11.1%., this could be regarded as acceptable limits for an estimation exercise. Coincidentally, the average BCI for all the locations over the 9 years was 1.22.

Recommendations

i. Building materials, plant hiring rates database management should be taken seriously and to be handle by experts that appreciates the information they are gathering.

ii. National labour rates published by FOCI should take cognizant of regional differences in cost of living, this will provide realistic reflection of the States Index numbers and eventually will lead to a more robust National BCI.

iii. This study should be extended to cover 36 states of the federation and Federal Capital Territory, Abuja to provide a fair data representation to develop Building Cost Indices for Nigeria. This will enable establishment of BCI that will be far reaching for application by organisations with offices across the federation.

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ASSESSMENT OF POST-PROJECT REVIEW SYSTEMS FOR CONSTRUCTION PROJECTS IN ABUJA, NIGERIA

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The purpose of this study is to assess the post-project review systems used by selected stakeholders on construction projects in Abuja, Nigeria. The study focuses on the post-project review techniques being used, benefits and obstacles affecting the post-project review process and the performance of these stakeholders. The research adopted the quantitative approach by conducting a field survey with a well-structured questionnaire administered to 168 participants with 101 returned. This was preceded by a literature review of previous studies identifying post-project review techniques and obstacles to carrying out post-project review on projects. Data was analyzed using descriptive statistical methods, a Five-Point Likert scale was used and analyzed using mathematical computations into mean item scores and ranked. The study established that the knowledge management technique is the post-project review system currently practiced towards capturing project knowledge and experiences. Ego and pride of team members towards participating in the process was found to be a major obstacle inhibiting the process despite the acceptance from participants that it facilitates collective learning, prevents knowledge loss and reduces reoccurring errors. The study recommended the consideration of other available post-project review approaches or techniques like the collective learning or cognitive (systematic) mapping to capturing project knowledge and experiences by stakeholders, and the expansion of the role of the prime consultant on projects to accommodate initiating and leading the facilitating of post-project reviews in line with global best practices.

Key Word: Post Project Reviews, Projects performance, Stakeholders, Nigeria.

INTRODUCTION

The Nigerian construction industry reported to be vibrant and one of the largest in Africa (Adebayo, 2002) is responsible for the execution of construction projects across the country. Like any construction industry across the globe it has been evidently plagued with poor performance of construction projects leading to time overrun, increased project cost, low quality of work, low productivity from project team members, amongst others (Odediran *et al.*, 2012). The need to improve the performance of construction projects in construction industries remains a worldwide concern. Takim *et al*. (2002) established the relationship between stakeholder's performance involved in a project and the overall performance of the project; and proposed a performance indicator framework in which the performance of stakeholders should be measured, evaluated and prioritized.

To improve performance, there is need to continually learn from the past, and to learn from the past one must have documented history of knowledge (Zedtwitz, 2002). Post-project reviews remain one of the most widely adopted approaches most especially in the industry to capture and transfer knowledge among participants on a project. It could be described as a process used to evaluate projects either during the construction phase or after completion to thoroughly examine and identify errors or mistakes that make projects fail or under-perform, so that lessons learned and knowledge gathered is made beneficial to future projects (Jimoh *et al*, 2016).

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Anbari *et al.* (2008) identified post-project review as a means to improving learning by developing historical data base obtained by profiling of customers, the work environment, and needs of the staffs involved on the project and the organization as a whole. Anbari *et al.* (2008) attributed the benefits of the post-project review process to linking effectiveness in achieving set goals, proper utilization of resources, and transfer of project experience and knowledge to future projects. The study further proposed two sets of primary and secondary project performance criteria. The primary performance measurement criteria to include initial budget cost, initial time and scope will be adopted for this study.

While the transfer of project knowledge to key decision makers in organizations by conducting post-audits and after-action reviews on projects in the Nigerian construction industry was brought to fore by scholars Martin and Ben (2012), the awareness of post-project review by professionals in the Nigerian construction industry was identified by Jimoh *et al.* (2016) where the importance, benefits and barriers of post-project review process were equally and extensively discussed.

However, the rate of occurrence of project failure and project under-performance coupled with the poor level of awareness of the post-project review process especially by professionals and key stakeholders in the Nigerian construction industry are the motivating reasons for this research as the study aims to carry out an assessment of the post-project review systems used on construction projects by selected stakeholders in Abuja, Nigeria. To achieve this, the following questions will be asked;

- What are the prevalent post-project review systems / techniques used by stakeholders?
- What is the level of performance of stakeholder's using the prevalent system in the past 5 years?
- What are the obstacles inhibiting the use of the prevalent post-project review systems?

LITERATURE REVIEW

Kerth (2000) defined Post – project review as a process that provides an opportunity for project participants to assess a project to ascertain both positive and negative aspects of the project and to use these learning points for future projects. In addition the discussion between participants or project members during the Post – project review process may lead to innovations and better solutions that can be captured from the various individuals. He further stressed this as a crucial factor as everyone of the project team member knows a bit of the whole story about the project.

Literatures of Post – project review have identified a number of systems to the application of Post-project review concept. Oluikpe *et al.* (2008) was able to group these systems into four categories namely:

- Post – project review as a knowledge management technique;
- Post – project review as a systematic (cognitive) approach;
- Post – project review as a process for organization learning; and
- Post – project review as a means for collective learning.

Post-Project Review as a Knowledge Management Technique

Post – project review in this approach identifies that there are several approaches in capturing organizational knowledge. Researchers such as: Jordan and Jones (1997); Al Ghassani *et al.* (2002); Carrillo *et al.* (2004); and Benett (2000); in their works all pointed out that organizational knowledge could either be individual or group knowledge, internal or external knowledge, and tacit or explicit knowledge. However, one of the most practical distinctions is that between tacit and explicit knowledge. Tacit knowledge is the knowledge stored in the heads of individuals and it is difficult to communicate externally or to share. Explicit knowledge is captured or stored knowledge in organizations manuals, procedures or information systems, and it is easily communicated and shared with other people or parts of an organization. To use Post – project review as a knowledge management technique there is need to structure or classify the knowledge an organization has interest in terms of its business context. In the construction context according to Bennett (2000), knowledge management is classified into three separate finish products which contain innovative construction, standard construction, and traditional construction. These separate products depend on the combination of knowledge both explicit and tacit. The finish innovative products compel a high use of tacit knowledge. Product

knowledge also relates to knowledge about different client types, associated relationships and different market characteristics (Jordan and Jones, 1997). Process factors relate to the technical and management systems used in production. The technical process involves the use of rigorous and automated intensive labor, which could be tacit knowledge or explicit automated (codified) knowledge as found in computer systems. Management processes vary between problem solving ones to programmed organizations. Problem solving organizations depend on tacit knowledge to turn out innovative works (Carrillo *et al.*, 2004). This is necessary to fulfill client's designs and contractor obligations that cannot be met by traditional answers. While it is necessary to have the right management shape, capable teams (designers and contractors) are critical for the construction phase (Al Ghassani *et al*., 2002).

Post-Project Review as a Systematic (Cognitive Mapping) Technique

Post – project review in this approach suggests the use of cognitive mapping in capturing knowledge for project success and continuous improvement in performance. The technique is used to reflect and compare the different perspectives of the parties involved in a project, understanding what project performance and success might mean to stakeholders in the project. Atasoy (2007), cognitive mapping is defined as a strong visual tool that reflects the knowledge and beliefs of people about a situation and or domain identifying the causes, effects and relations between them. Cognitive mapping has been used in the construction industry to study construction management issues by Edkins *et al.* (2007); disruption and delay in projects by Eden et al. (2000); and cost – time integration in construction projects by Poh and Tah (2006). According to Village *et al*. (2013), the process to draw out the cognitive map is usually done using the interview techniques through results from open-ended questions about a specific issue or problem. Participants present their views which are "concepts". The concepts are noted down and developed through even more open-ended questions. Relationships between these concepts are highlighted. The concepts are considered "nodes" and the connection between these concepts are identified and considered "links". Links have arrowheads that show the causative direction. Typical individual maps are made up of about 100 nodes, and maps created for groups are done by combining maps from individuals could contain as many as 700 nodes. Every participant or stakeholder in a project is driven by their own individual goals and success to different degrees that should result in the overall success of the construction project as a whole.

Post-Project Review as a Process for Organization Learning

This approach of Post – project review involves the capture and learning of knowledge at the organizational level. Roth and Kleiner (1998), Sowards (2005), Branis and Christopolous (2005) are among the few researchers that identified the concept of learning histories which are applied by action investigative projects to improve organization learning capabilities. A learning history highlights reporting and capturing "significant results". Significant results are a link to the performance effects of learning. When something is achieved by an organization that exceeds or meets expectation, enhances results in business, carry out successful change in policy, alter patterns of behavior and so on – that is evident of significant change in performance.

According to Roth and Kleiner (1998) the learning history process is a technique which demands the review of an organization shift by a conscious effort towards the improvement of competence of the participants in a change process to appraise their program and its progress with the benefit of creating materials that should aid in disseminating knowledge to other participants. These process components of learning will ultimately generate a reaction or a reply cycle at the organizational level.

Post-Project Review as a Collective Learning Technique

The Post – project review through the collective learning technique is a specifically focused and targeted approach of conducting post – project reviews which links key stakeholders within the project (Oluikpe et al., 2005).

According to Carrillo (2005) the use of this approach was recommended for the construction industry identifying it as an extremely desirable action or activity that does not occur. The researcher recognized the significance of sound project management where explicit knowledge in the form of specifications, drawings, standard contracts and so on is documented. It was equally pointed out that there was a necessity to capture experience and knowledge on methods and tools used and emphasized the significance of lessons learned to profile specific problems, describe successful and unsuccessful solutions, relevant people to contact and so on.

These four techniques are all learning tools and are used to create knowledge histories on projects (Oluikpe et al., 2005). However, the knowledge management and organizational learning techniques focuses more on post-project reviews carried out internally within an organization and barely involves external participants from other organizations (Carrillo 2005; Anbari *et al.* 2008) while the use of cognitive mapping and collective learning technique focuses more on the involvement of major stakeholders (client, consultants and contractors) as external participants by comparing and evaluating their performance and perspectives of the project even as it may change over time (Carrillo *et al.* 2004; Atasoy 2007).

Obstacles to Post-Project Reviews

Conducting post-project reviews come with numerous benefits, Carrillo (2005) and Oluikpe *et al.* (2005) identified some of these to include improvement in project performance and success, provides utilizable knowledge, facilitates collective learning, prevents knowledge loss and minimizes repeated errors. However, there are equally barriers to the process, Zedtwitz (2002) highlighted some barriers to learning from post – project review which he grouped into four main categories;

- Psychological barriers
- Team based short comings
- Epistemological constraints
- Managerial problems

Busby (1999), Carrillo (2005), and Jimoh *et al*. (2016) summed up the following drawbacks experienced with the implementation of post-project reviews as follows;

- It could be time consuming
- It involves looking back at projects which could be embarrassing and seen as cynical
- Poor internal team communication
- Time and budget restrictions
- Lack of maintenance of data during project
- Fast track procurement nature of the project
- Political patronage to cover up inefficiency and corruption
- Poor organization culture
- Incompetence to carry out reviews
- Reluctance to blame

While researchers agree on the overall positivity and successes of carrying out post-project reviews, obstacles to learning could further enhance project team's shortcomings especially when it involves their personality (De Gans, 2010).

METHODOLOGY

The stratified sampling technique was adopted for this study as it is a process of dividing members of a population into homogenous sub-groups before sampling. A total of 119 Architectural firms, 62 Quantity Surveying firms, 9 Services firms as consultants, and 16 Large Construction firms were identified from the Architects Registration Council of Nigeria (ARCON), the Nigerian Institute of Quantity Surveyors (NIQS), the Council of Registered Engineers (COREN), and the Federation of Construction Industry (FOCI).
The simple random probability sampling technique was used to give all participants in each sub-group an equal chance of being selected. Data used for this study was collected through primary sources. Primary data was collected through the administering of a well-structured questionnaire.

A total of one hundred and sixty-eight (168) respondents were identified. One hundred and fifty-three (153) of these representing consultants comprising of Architecture firms, Quantity Surveying firms, Services firms, while fifteen (15) of these respondents represented large construction companies. A total of one hundred and one (101) respondents completed and returned the questionnaires. Table 1 shows the average rate of response from the respondents with ninety three (93) representing the consultants and eight (8) representing the large construction companies. This translated to a response rate of 60.11%. The questionnaire was

rated on a five-point Likert type scale ranging from strongly disagree (1) to strongly agree (5). The data was analyzed using: Mean Item Score**.**

Table 1: Response rates of respondents

Respondents	Large Contractors	Consultants	Total
No of questionnaire administered	15	153	**168**
No of questionnaire returned	8	93	**101**
Rate of response	53.33%	60.78%	**60.11%**

Source: Researchers analysis (2017)

DATA ANALYSIS AND DISCUSSION

Figure 1 shows that out of the 101 returned questionnaires showed that 79% of the respondents have practice in the industry between 5 – 10 years while 21% have been practicing in the industry well above 10 years.

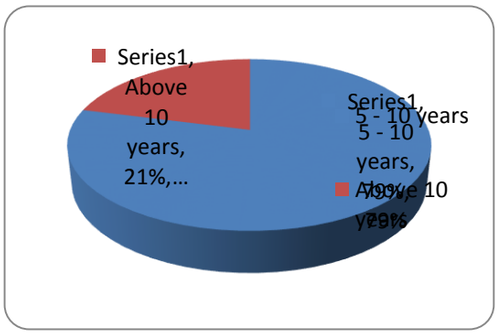

Figure 1: Years of Practice Experience in the Construction Industry.

Figure 2 shows the response on respondents' involvement in any project that has conformed to initial time, and within initial scope given their years of experience in the construction industry. 85% of the respondents indicated 'no' while 5% of the respondents indicated 'yes'. 10% responded 'never' and do not believe it is possible to have such a building project. Findings from the study to research question three revealed that 85% of the stakeholders have not been involved in any project that has been completed within initial budget, initial time and within scope in the past 5 years, thereby failing to meet the primary triple constraint of performance measurement criteria as proposed by Anbari *et al.* (2008) for initiating a post-project review process.

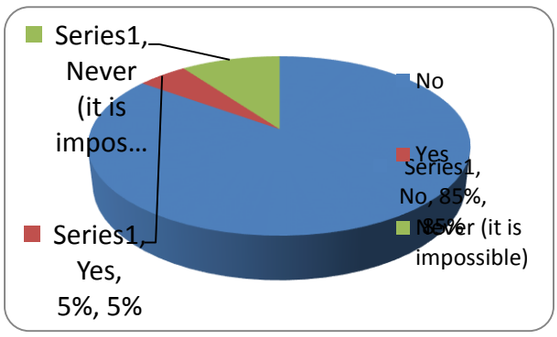

Figure 2: Respondents Projects that Conforms to Initial cost, Time and Scope.

Respondents were asked to indicate their level of participation in any such post-project review given their level of professional experience in the industry. Table 2 shows that respondents from contractor's organizations are involved in some post-project review process almost on every project while 10.90% and 6.25% representing 6 respondents and 2 respondents from the Architectural and Quantity surveying firms indicating participating a lot in a post-project review process on every project. 60%, 28.13%, and 33.33% of the respondents from the consultants indicated that they have only participated in post-project

review process a few times. 29.09%, 65.62%, and 66.66% stated that they have never participated in any post-project review process on any project.

Table 2 Level of participation in post-project review process.

Frequency of participation in PPR process	Consultants			Contractors
	Architects	Quantity Surveyors	Services Engineers	
A lot (Almost on every project)	10.90% (6)	6.25% (2)		100% (8)
Only a few times	60% (33)	28.13% (9)	33.33% (2)	
None (Never participated in any	29.09% (16)	65.62% (21)	66.66% (4)	
Total	100%	100%	100%	100%

Source: Researchers analysis (2017)

Respondents were asked on the post-project review systems used on projects to capture knowledge, lessons learned and experiences with the intent for these knowledge to be passed on to other projects. Eight respondents representing one hundred percent (100%) of large construction companies indicated that knowledge and lessons learned are put in writing and the procedural manual are made accessible for participants for future projects. Table 3 shows that 16.36% and 9.38% representing 12 and 3 respondents from Architecture and Quantity surveying firms acknowledge of an available manual which is updated and made available for participants moving to new projects. 78.18%, 90.62%, and 100% being respondents from the consultants indicated that project knowledge and experience is carried on to other project and shared by the individual participant. These post-project review systems were highlighted by Oluikpe et al. (2005) and Carrillo (2004) as internal learning process within an organization, and could be described as individual tacit knowledge management and group explicit knowledge management. The two styles fall under the use post-project review as knowledge management technique identified by Jodan et al. (1997) and Al-Ghassani (2002). Eluifoo (2017) stated that the post-project review process encompasses knowledge management and is contemporary to organizational learning. Such a process could begin from individuals, groups and finally through the entire organization.

Table 3: Post-project review techniques / systems used on projects.

Project knowledge and experience transfer	Consultants			Contractors
	Architects	Quantity Surveyors	Services Engineers	
Knowledge is put in manual writing and made accessible to participants of future projects	16.36% (12)	9.38% (3)		100% (8)
Knowledge and experience is shared by individual participant moving to a new project	78.18% (43)	90.62% (29)	100% (6)	
Visualization and analysis of project success factors of stakeholders pre and post project (cognitive mapping of project)	-	-	-	-
Collective meeting of major stakeholders involved in projects at post-project phase	-	-	-	-
Total	100%	100%	100%	100%

Source: Researchers analysis (2017)

Respondents were requested to indicate the obstacles preventing the use post-project review process using a five-point scale: 1 = strongly disagree, 2 = disagree, 3 = undecided, 4 = agree, 5 = strongly agree. Table 4 below shows that the factor, 'ego and pride of team members' ranked first with a standard deviation (SD) = 0.347 and a mean score of (M) = 4.861; 'lack of management support' ranked second (SD = 0.366, M = 4.841); 'poor

organization structure' ranked third (SD = 0.602, M = 4.762); 'poor team internal communication' and 'fast track procurement nature of many construction projects' ranked fourth and fifth respectively (SD = 0.433, M = 4.752) (SD = 0.577, M = 4.742). The least ranked factor 'expensive/high cost due to company overhead' ranked twenty fourth (SD = 0.547, M = 2.613); 'it overloads project as the need to close project and move on to another' ranked twenty third (SD = 0.944, M = 2.782); 'lack of organization awareness about post-project review' ranked twenty second (SD = 0.748, M = 2.802); 'manpower intensive', and 'time and budget restrictions' ranked twenty first and twentieth respectively (SD = 0.424, M = 2.802) and (SD = 0.848, M = 2.980).. Jimoh *et al.,* (2016) and Anbari *et al.,* (2008) highlighted these barriers and the need for the right structure and stages from normimg to performing. Carillo (2005) also identified the need to develop it as a culture in organizations to reduce ego and pride of participants.

Table 4: Obstacle Factors to Post-Project Review Process.

Factors	Respondents (N)	Mean (M)	Standard deviation (SD)	Rank
Ego and pride of team members	101	4.861	0.347	1
Lack of management support	101	4.841	0.366	2
Poor organization structure	101	4.762	0.602	3
Poor team internal communication	101	4.752	0.433	4
Fast track procurement nature of many construction projects	101	4.742	0.577	5
Lack of management support	101	4.732	0.545	6
Political patronage to cover up inefficiencies and corruption	101	4.514	0.701	7
Reluctance to blame game	101	4.475	0.794	8
Inability to reflect on past experiences	101	4.415	0.652	9
Lack of interim reviews	101	4.376	0.892	10
Lack of expertise / incompetence to carry out reviews	101	4.376	0.858	11
Lack of maintenance of data during project progress	101	4.336	0.827	12
It involve looking back at problems	101	4.326	0.825	13
The beneficiaries are future project	101	4.267	0.676	14
Lack of resources to act on the outcome of the reviews	101	4.217	0.729	15
Immaturity of project management systems	101	3.247	0.817	16
Lack of incentives	101	3.059	0.967	17
Objectives are ambiguous	101	3.029	0.805	18
Time consuming	101	3.000	0.824	19
Time and budget restrictions	101	2.980	0.848	20
Manpower intensive	101	2.802	0.424	21
Lack of organization awareness about Post-project reviews	101	2.802	0.748	22
It overloads project as the need to close project and move on to another	101	2.782	0.944	23
Expensive / High cost due to company overhead	101	2.613	0.548	24

Source: Researchers analysis (2017)

Findings from the study revealed that the prevalent post-project review techniques used to capture lessons learned on projects is the knowledge management technique. Despite acknowledging the benefits and advantages of initiating and carrying out post-project reviews on projects, the performance of stakeholders on projects (contractors and consultants) have not really been able to meet the performance criteria of initial time, initial budget and within project scope. Ego and pride of participants, lack of proper documentation, lack of management support, poor internal and external communication amongst project team members, and lack of structure are amongst the obstacles that inhibit the post-project review process. The literature review clearly identified other post-project

review techniques and systems used to capture project knowledge and lessons learned like the use of cognitive mapping and collective learning technique which according to Carrillo (2005) and Oluikpe et al. (2005) provides for more external participants of major stakeholders for constructive criticism of performance and perspectives of the project. Construction business is very profitable and at the same time comes with lots of risks, every knowledge gained on a project is an added advantage to the stakeholders involved especially when used on future projects.

CONCLUSION AND RECOMMENDATIONS

The research study has assessed the post-project review system used on construction projects by selected stakeholders in Abuja, Nigeria.

The study established that despite the awareness of stakeholders in the use of post-project review process as an important and necessary tool that helps improve project performance over time, the performance of stakeholders on project has continuously witnessed a decline and not met the required performance criteria of initial budget cost, time and scope.

The study also established that the current post-project review system being used on projects by these stakeholders is the knowledge management techniques where project experience and knowledge are either captured solely by the participant involved on the project and passed on in future projects, or it is captured in a manual and made available for future participants on future projects in an explicit form which remains an internal process within the organization.

The study equally revealed that the post-project review system is mainly inhibited by the ego and pride of project participants, lack of management support and structure, poor team communication and the fast track nature of project contracts.

As a result of the findings from this research the following recommendations are made;

i. That a conscious effort should be made by stakeholders to consider the use of other post-project review techniques / systems like the cognitive mapping approach or the collective learning technique. This could provide the perfect environment for most key stakeholders to come together and share their knowledge and experiences from an internal and external point of view while making sure that implementation, dissemination and documentation of the process are done in line with global best practices.

ii. It is recommended that efforts should equally be made towards improving team communication, and providing the right environment and structure to determine when and how often a post-project review should be carried out on projects with the involvement of external participants. This could be done by expanding the role of the prime consultant as the initiator of the process as he / she remains the link between major stakeholders involved on a project no matter what phase of the project they are engaged.

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DESIGN FIRM'S PERCEPTION ON RISK OCCURRENCE AND IMPACT ON CONSTRUCTION PROJECT BUDGET PERFORMANCE

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Researches have shown that the level of accuracy of construction project budgets is significantly affected by the level of risk information available during budget preparation. These risk factors are not strange to the Nigerian construction practitioners, the relative likelihood of occurrence and impacts in case of occurrence remain a critical issue of concern. This study therefore, identified and assessed the risk factors influencing construction project budget performance. Data for this study were collected via questionnaire survey of design firms operating in Abuja, Kaduna and Kano. The responses obtained were analysed using descriptive analysis, mean, standard error and standard deviation. The means were used to rank the factors in decending order. The findings revealed the eleven (11) risk factors with high level of occurrence. The findings also revealed the top 10 significant risk factors impacting the construction project budget performance in Nigeria. With this information, Design Firms will be able to better provide information on the influence of the risks on construction project budgets performance at the time of preparation. More so, as risk elements are intrinsic in construction project budgets, the findings of this study will have ramifications for all project types on what is required for their reasonable budgetary performance and delivery. Future research could be carried out on risk factors affecting budget performance at difference phases of project completion than the ones adopted for this study. This will justify the differences at those phases of project completion possible.

Keywords: Construction project budget, Budget Overrun, Risk and risk factors

INTRODUCTION

Construction budget is an estimate of probable project target cost which is developed throughout the construction cycle (Odeyinka and Dada, 2016). It is a formal statement of the financial resources set aside for carrying out of specific activities at a given period of time. Association for Project Management (APM, 2012) defined budgeting as a process of estimating the cost of a proposed project and setting an agreed target. However, the primary measure of success in preparing the budget estimates is to predict the project capital cost and the whole life cost accurately at the project inception (Odeyinka and Dada, 2016). Building clients, both in housing and public buildings, continue to experience cost overruns on set budgets. This has proved to be a serious and costly problem in the construction industry (Jackson, 2002). The unending increase in the construction cost of projects over and above what is budgeted for, in the contract, has been a major concern to the construction industry as a whole (Odeyinka and Dada, 2016). Potts and Ankrah (2014), revealed that most clients work within tight pre-defined budgets or cost plans, prepared by Cost Consultants (Quantity Surveyors) during design process. This budget is expected normally not to be exceeded; or else the whole scheme may fail. However, there is an evidence in the construction management literature indicating that it is difficult to find a project in which the final contract sum is the same as the initial budget provided and given to the client (Akintoye, 2000; Aibinu and Pasco, 2008; Odusami and Onukwube, 2008; Odeyinka, 2010; Enshassi et al., 2013).

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This, according to Akintoye & Macleod (1997) and Odeyinka (2000) could be as a result of risk factors inherent in construction projects from the inception to the completion stage.

Risk, according to Project Management Institute (2000) is an uncertain event or condition that if it occurs could have positive or negative effect on the project objectives. Association for Project Management (APM, 2012), also defined risk as an uncertain event or set of circumstances that should it occur, could have an effect on the achievement of one or more of the project objectives. Some of the major causes of risk in construction may include estimating error, design error, tendering risk, financial risk, and changes in political and economic climate among others (Odeyinka and Dada, 2016). Size, complexity of the project, location, speed of construction and familiarity with the type of procurement system can also be one of the major causes of risk.

Not surprisingly, projects around the world have revealed many challenges on the construction projects, one of which is the construction budget overruns (Nkado, 2010). In United Kingdom (UK), it was reported that 33% of the clients had their projects exceeding the budgeted cost allocated generally (Jackson, 2002). In Malaysia also, 46.8% of public sector had budget overrun in the construction industry and only 37.2% of private sector projects were completed within the budgeted cost prepared at the early stage (Sambasivan and Soon, 2007). In Nigeria, it has almost become a tradition that a project cannot be completed at the budgeted sum, going by the countless projects with more than 50% budget overruns (Odeyinka and Dada, 2016). A study of the effects of cost control on public and private developer's cost performance by Ayodele and Alabi (2014), revealed that 89% out of the eighty nine (89) projects assessed for public and private clients in Nigeria, experienced budget overrun.

Extensive review of literature in the field of budget for construction projects revealed that the level of accuracy of construction project budgets are significantly affected by the level of risk information available during budget preparation (Akintoye, 2000; Enshassi et al., 2005; Aibinu and Pasco, 2008; Odusami & Onukwube, 2008; Onukwube et al., 2009; Oladokun et al., 2011; and Jafarzadeh, 2012). These risk factors are not strange to the Nigerian construction practitioners, the relative likelihood of occurrence and impacts in case of occurrence remain a critical issue of concern (Odeyinka and Dada 2016). The aim of this study is to assess the risk factors affecting construction project budget performance, based on the perception of design team on the relative likelihood of occurrence and impact in case of occurrence of the risk factors.

The Construction Project Budget

Construction project budget is a formal statement of the financial resources set aside for carrying out of specific activities at a given period of time. It is also an estimate of a probable project target cost that is developed throughout the construction life cycle (Odeyinka and Dada, 2016). Association for Project Management (APM, 2012), have defined budgeting as a process of estimating the cost of a proposed project and setting an agreed target. Putzer (1995) cited in Wanyona, (2005) stated that the aim of budget is mainly to aid the planning process, to communicate cost plans to the various cost managers and to control costs. The budgeting process ensures that managers plan for future operations.

According to Odeyinka and Dada (2016), the primary measure of success in preparing budget estimates is to predict the project capital cost and the whole life cost accurately at the project inception. Anigbogu et al. (2007), concurred that the first step toward ensuring that problems are avoided in construction process is the production of accurate budget estimates. The effect of bad estimate at the early stage of a construction project includes embarking on an infeasible project and rejecting feasible project (Lowe et al., 2006). Wahab (1994) discussed some of the operational problems in the Nigerian construction industry and concluded that the full implementation of the National Construction Policy in the country is crucial to the development of realistic budget for the construction industry. Cabe (2003) posited that a project should be controlled by considering the cost, value and risk periodically throughout its life.

Budget is therefore, useful to all parties involved in a project as a planning and control tool. Budget could be employed by the client to get priorities among projects competing for limited resources. It also enables the client to set the machinery in motion for meeting the interim valuations as when due and also used to justify the elimination of uneconomic project(s) as well as the revision of his objectives to meet the demand of a manageable

project. Budget could also be employed by the consultants as cost control tool in managing construction project.

Construction Budgets Overrun

During the execution of any construction project, cost is a very important factor for the project to succeed. The initial budget estimated does not actually represent the final cost expected. This has been confirmed by some researchers. Potts and Ankrah (2014), reported that most clients work within tight pre-defined budgets or cost plans, prepared by Cost Consultants (Quantity Surveyors) during design process. This budget is expected normally not to be exceeded; or else the whole scheme may fail (Adafin et al., 2016). However, the unending increase in the construction cost of projects over and above what is budgeted for in the contract, has been a major concern to the construction industry as a whole (Odeyinka and Dada, 2016) .

Hence, risks identified at the project development stage can be quarantined and dealt with. If risks are properly identified and priced at the design stage, final cost of the project can be expected to be within budget. However, there is an evidence in the construction management literature indicating that it is difficult to find a project in which the final contract sum is the same as the initial estimate provided and given to the client (Akintoye, 2000; Aibinu and Pasco, 2008; Odusami and Onukwube, 2008; Odeyinka, 2010; Enshassi et al., 2013). Studies around the globe UK, Middle East, Asia and some parts of Africa, concluded that where budgets are prepared, deviations between the budgeted cost and contract sums are common in the region of +1% to +12%. These deviations are cited in (Odeyinka and Yusif, 2011; Oladokun et al., 2011; Enshassi et al., 2013). Morrison (1984) has found this disparity in the UK construction industry where data on educational, commercial and housing projects were collected from seven separate quantity surveying firms and found that a mean deviation of 12% was obtained by these quantity surveyors. Similarly, Ogunlana (1991) also reported the significant deviations that were observed between design cost estimates and accepted tenders, using the information that were sourced from seven design offices on maintenance projects in the UK. Also in Singapore, Cheong (1991), found that the disparity between budget estimates and contract sums is generally between 5% and 10%. Cheong's study gathered opinions across a wide range of quantity surveyors. Significantly, Cheong's analysis of 88 projects (i.e., educational, commercial, residential, public and community, etc.) from one quantity surveying consultancy in Singapore found that the deviations between the budget estimates and contract sums ranged from 33.79% (overestimates) to 31.30% (underestimates). In New Zealand Construction Industry, Adafin et al. (2016), reported that the reliability of the budget varied depending on project types. Whereas a deviation of -3.67% and +3.95% was obtained for the residential projects; between -3.98% and +12.15% deviation was for educational projects; Commercial projects attracted -14.22% and +16.33% while the refurbishment projects had a deviation of -10.07% and +30.14%. In Nigeria, Odeyinka and Yusif (2003), using cost data on preliminary cost estimates and lowest tenders that were received from 24 quantity surveying firms, found the following: 17 out of 40 residential, commercial and educational building projects (42.5%) had lowest tender sums below the Quantity Surveyors' estimates, and this ranged between 1% to 47%. 23 of the projects (57.5%) had lowest tender sums above the quantity surveyors' estimates, and this ranged from 1% to 174%. An analysis of the pre-tender cost estimating performance of a Nigerian consulting quantity surveying firm by Oladokun et al. (2011) , found that on 81 building projects (residential, commercial, educational, office and health), there was an estimate deviation reflecting underestimates of about 34%. According to Odeyinka (2007), the major attributable factor for these deviations is the risks inherent in construction project developments. Meanwhile, effective risk management requires proper determination and integration of risks into the estimation of construction costs in some way other than the use of intuition and loosed rules. Deterministic approaches to risks could help curb budget/cost and schedule/time overruns.

The concept of risk and risk factors impacting budget performance

The concept of risk

The concept of risk varies according to individual's experience, attitudes and viewpoint. For instance; contractors, designers and engineers may look at it from the opinion of the technology, while lenders and developers may observe it from the economic or financial point of view. Kartam and Kartam (2001), have defined risk as the probability of occurrence

of some uncertain, unpredictable and even undesirable event(s) that changes the cost prospects of a project. Smith et al., (2009), defined risk as a decision that may have a range of possible outcomes which a known probability can be attached to. Akintoye and MacLeod (1997), stated that risks in construction have been considered as a very important aspect because of their effect in terms of occurrence and impacts on cost, quality and time overruns in construction projects. According to Wanyona (2005), risk is an exposure to financial cost impacts, arising from involvement in the construction process where variations in cost result in uncertainty in forecasting building cost. Baloi and Price (2001) maintained that, risk within construction projects could be defined as the likelihood of a detrimental event occurring to the project. Similarly, Wideman (1986) cited by Odeyinka (2010) defined project risk as the chance of certain occurrences adversely affecting project objectives. However, Chapman (2001) argued that this definitions does not take into consideration, the possibility of a positive outcome and he therefore, defined risk as an event, which when occurred, will have a positive or negative effect on the achievement of a project's objectives. Yoe (2000), defined risk as a characteristic of an event or action in which a number of outcomes are possible, the particular one that will occur is uncertain, and at least one of the possibilities is undesirable. According to him,

Various authors have made important basic statements about risk. Chapman (2001) concluded that, risk is generally viewed within the context of the probability of different outcomes and that the general attitude towards risk is its identification, evaluation, control and management. Most risk management literature explained that risk is as an event that occurs with a certain probability in combination with a consequence in terms of its occurrence. Risk can be defined in a simpler approach as:

Risk = probability of risk occurring x impact of risk occurring (Embrechts et al., 2005).

Winch (2010), reported that most definitions of risk include both positive and negative outcomes. Although, studies have indicated that project managers tend to use the term risk almost for the negative consequences of an event. But Winch (2010) has criticised this approach and says that the attitude can lead to a lack of determination when it comes to managing the opportunities in a project. The definition which was established by PMI (2013), stated that, risk is an uncertain event or condition that if it occurs, has a positive or negative effect on a projects objective.

For the purpose of this study, risk may be defined as an exposure to economic cost impacts, arising from involvement in the construction process where variations in cost result in uncertainty in estimating building budget. According to Winch (2002), risk is inherent in construction from the inception to the completion stages of a project's life. According to him, less information is available at the inception of a construction project, as such the less the amount of information available, the higher the level of risks and uncertainties. According to Ramus et al. (2005), such uncertainties would come from lack of site investigation information, leading to problems with the foundation, incomplete drawings leading to variations during the construction phase, little or no information about mechanical and electrical engineering services, leading to inclusion of prime cost sums and provisional sums in the BOQ among others.

Various researchers have adopted different approaches in identifying risks inherent in construction. Ashworth and Hogg (2002) ; Odeyinka and Dada (2016) using risk register have identified risk sources in construction at pre contract stage to include design risk, competitive tendering risk, tender evaluation risk and estimating risk. Chapman and Ward (1997), also submitted that generally, risk is viewed within the context of the probability of different outcomes and that the general attitude towards risk is its identification, evaluation, control and management.

Risk factors impacting Budget Variability

Researchers from the developed and developing countries, have identified risk factors in the early stage of the projects during the development process of construction project budgets. These include studies by (Akintoye and Fitzgerald, 2000; Ling and Boo, 2001; Trost and Oberlender, 2003; Liu and Zhu, 2007; Aibinu and Pasco, 2008; Odusami and Onukwube, 2008; Farinloye et al., 2009; Oladokun et al., 20011; Jafarzadeh, 2012; Enshassi et al., 2013; Ameyaw et al., 2015; Adafin et al., 2016) . Most of the literature suggests that factors, identified, have significantly caused variations in the construction project budgets (Adafin et al., 2016). Therefore, proper risk analysis might offer a partial solution, by reducing the

deviations of the projects. However the risk factors have been identified and are summarised in the table below.

Table 1: Risk factors identified from the literature to impact on construction project budget.

– Client's brief	– Inadequate cost plan/tender documentation
– Project scope	– Availability and supplies of materials
– Method of construction	– Availability and supplies of labour
– Site constraints	– Project team's experience of the construction type
– Expertise of consultants	– Type and quality of cost planning data
– Quality of information and flow requirements	– Changes in cost planning data
– Extent of pre-contract design completion	– Availability of design information
– Type of bidding	– Defective design and specification
– Type of project	– Client's change/changes in owner's requirements
– Type of structure	– Unforeseeable fluctuation in labour prices
– Type of client	– Unforeseeable changes in materials prices
– Contract conditions	– Under-estimation
– Project location	– Little or no information about M&E services
– Project complexity	– Zonal rates Market condition
– Tender period	– Procurement system
– Government legislation/policy	– Planning requirements or restrictions
– Site investigation information (geological/sub-ground conditions)	– Lack of full implementation of the National Construction Policy
– Tender inflation	
– Legal requirements	

Source: Review of literature

METHODOLOGY

This study adopted quantitative research method (which is sometimes referred to as scientific approach). This approach was developed in natural sciences originally to study natural phenomena. The approach relies on the objectivists' view of the social world and generally involves the collection and analysis of data using statistical procedures and analysis. One of the advantages of quantitative methods is their ability to use smaller groups to make inferences about larger groups that would be prohibitively expensive to study (Holton and Burnett, 1997) cited in (Abdurazaq et al., 2015).

This study was conducted through examination of relevant literature and field survey. Lists of risk factors on construction project budgets were identified from the literature. The identified risk factors were investigated in terms of their likelihood of occurrence, their significance impact when they occur through a self-administered questionnaire with closed-ended questions. The self-administered questionnaire was designed to have two sections (sections A and B). Section A of the questionnaire was designed to get demographic information of the respondents. Section B was designed to seek perceptions of the respondents (i.e. design team that are involved in nearly or already completed projects in Nigeria). These include, Architects, Quantity Surveyors, Structural Engineers, Electrical & Mechanical Engineers and the Clients within Abuja, Kaduna and Kano. These places were selected as the study area for the survey on the basis that 31% of these firms are for the professionals (irrespective of the client organizations) are located in Northern Nigeria (Corporate Affairs Commission, 2016). Stratified sampling method was adopted since the professionals involved have their head offices and branches situated within the states and could easily be accessed. Stratified sampling is adopted where sampling frames include such information about the population as sex, age, ethnicity, and region of residence, and because the variables being measured are frequently expected to differ across these subgroups (Stangor, 2014),

The respondents were requested to rank on a scale of 1 to 5, the likelihood of occurence as well as the impact (severity) of the risk factors identified from literature. Where 1= insignificant, 2= low, 3= medium, 4= very high and 5= extreme. A study conducted in European perspective unreservedly recommended that 5-point scale provides better quality of data compared to 7 or 11-point scale (Weijters et al. 2010; Revilla et al. 2013). According to Weijters et al (2010) and Revilla et al (2013), 5-point scales are used when respondents are general public.

The study employed the use of both descriptive and inferential methods of analysis to analyse the collected data in order to achieve the aim of the study. The mean, standard error and standard deviation were computed and were used to rank the likelihood of occurence as well as the impact (severity) of the factors in decending order with the use of micrsoft excel.

The self-administered questionnaire was distributed to 254 design firms in Northern Nigeria which were sampled from the 750 design firms registered with Corporate Affairs Commission (CAC) in Abuja Abuja (420), Kaduna (291) and Kano (39). This sample size of 254 was determined based on Krejcie and Morgan's (1970) formula, for getting a representative sample size from a large population. Out of the 254 questionnaires distributed, 103 were returned and found useful for analysis, thereby giving a response rate of 40.55% which is sufficient for the study. The study employed the use of both descriptive and inferential methods of analysis to analyse the collected data in order to achieve the aim of the study. Furthermore, the independent samples t-test was performed in order to see if the differences between the groups are statistically significant at $\alpha = 0.05$. All these statistical analyses were undertaken using the statistical package for social science (SPSS) for Windows version 23.

RESULTS AND DISCUSSIONS

Results of Demographic Features

Table 2: Demographic information of the respondents

Position	Frequency	Percent
Designation of the respondents		
Architect	14	13.6
Civil Engineer	30	29.1
Mechanical Engineer	27	26.2
Electrical Engineer	3	2.9
Quantity Surveyors	29	28.2
Total	**103**	**100.0**
Academic Qualification of the respondents		
PhD	1	1.0
Master's degree	28	27.2
Bachelor's degree	29	28.2
PGD/graduate diplomat	35	34.0
ND/HND	10	9.7
Total	**103**	**100.0**
Professional year's of experience of the respondents		
0 – 5years	5	4.9
5 – 10years	9	8.7
10– 15years	23	22.3
15 – 20years	22	21.4
More than 20years	44	42.7
Total	**103**	**100.0**
Size of projects handlled by the design firms surveyed		
Small (0-50m)	43	41.7
Medium (51-250m)	2	1.9
Large (Above 250m)	25	24.3
Not Applicable	33	32.0
Total	103	100.0
Nature of the project client		
Public Client	31	30.1
Others	30	29.1
Private	29	28.2
Corporations	13	12.6
Total	103	100.0

Source: field survey, 2017

From table 2 above, the demographic information obtained from the respondents include their designation, academic qualifications, company's years of experience, size of projects handled by their firm and the nature of the project client. The result revealed that majority of the respondents (29.1%) were Structural Engineers who were deeply involved in the firm's projects. Twenty-nine of the respondents, representing 28.2% were Quantity

Surveyorsthat are also deeply involved in the firms projects. 27 were Mechanical Engineers (26.2%), 14 were Architects (13.6%) and 3 Electrical Engineers (2.9%). The result also revealed that 34% of the respondents hold PGD/graduate diplomat, while 29 of threspondents holds Bachelor's degree (28.2%). This was followed by 28 respodents with master's degree (27.2%), 10 ND/HND hloders (9.7%) and 1 PhD holder (1%). The result also shows that 42.7% of the respondents have more than 20 years of their companies' experience. 22.3% have 10-15years, 21.4% have 15-20years, 8.7% have 5-10years and 4.9% have 0-5years of experience. 25.75% of the respondents have handled project size of above 250Million with 30.1% for public client, 28.2/% private client and 12.6% corporations. In light of these, the demographic information indicates that the respondents are experienced in project development and have some knowledge of issues relating to project risks. Therefore, are suitable to provide correct answers to the questions in the research questionnaire

Result of occurence ofrisk factors affecting Budget Performance

Table 3: shows the result of the analysis of the likelihood of occurrence of the risk factors.

Risk factors	Respondents' Perceptions					Mean	Std. Deviation	Rank
	1	2	3	4	5			
Unforeseeable changes in materials prices	1	6	15	53	28	3.98	0.863	1
Under-estimation	3	6	25	40	29	3.83	1.001	2
Market condition	0	10	21	51	21	3.81	0.875	3
Lack of skilled labour	3	10	26	45	19	3.65	0.987	4
Client's change/changes in owner's requirements	1	17	21	48	16	3.59	0.975	5
Changes in cost planning data	0	10	38	40	15	3.58	0.858	6
Defective design and specification	2	15	24	48	14	3.55	0.967	7
Little or no information about M&E services	3	8	46	23	23	3.53	1.018	8
Expertise of consultants	0	9	47	32	15	3.51	0.850	9
Project scope	2	18	27	39	17	3.50	1.028	10
Increase in duration of the project	3	7	43	36	14	3.50	0.917	11
Project team's experience of the construction type	3	4	50	33	13	3.48	0.873	12
Lack of expertise in client's organisation	9	14	22	36	22	3.47	1.219	13
Procurement system	8	13	31	26	25	3.46	1.211	14
Government legislation/policy	2	18	37	29	17	3.40	1.023	15
Type of structure	1	20	39	27	16	3.36	0.999	16
Type and quality of cost planning data	5	12	35	45	6	3.34	0.935	17
Quality of materials	4	18	40	24	17	3.31	1.067	18
Extent of pre-contract design completion	4	17	35	40	6	3.26	0.943	19
Unforeseeable fluctuation in labour prices	8	10	46	26	13	3.25	1.055	20
Quality of information and flow requirements	7	10	42	35	7	3.25	0.974	21
Tender period	5	10	54	26	8	3.21	0.904	22
Project complexity	7	31	23	29	13	3.10	1.167	23
Availability and supplies of materials	3	22	51	18	9	3.08	0.926	24
Inadequate cost plan/tender documentation	8	13	52	24	6	3.07	0.952	25
Quality of work done	6	32	30	21	14	3.05	1.141	26
Lack of multi skilled supervisor/consultants	20	16	21	32	14	3.04	1.343	27
Contract conditions	0	37	35	23	8	3.02	0.950	28
Sustainability of materials used and quality	7	38	24	20	14	2.96	1.179	29
Availability of design information	6	32	32	27	6	2.95	1.023	30
Site constraints	3	32	44	16	8	2.94	0.948	31
Planning requirements or restrictions	3	35	44	12	9	2.89	0.959	32
Tender inflation	6	37	31	24	5	2.85	1.004	33
Type of client	14	25	31	28	5	2.85	1.115	34
Legal requirements	12	22	46	17	6	2.83	1.030	35
Project location	27	12	30	24	10	2.79	1.326	36
Client's brief	15	35	22	22	9	2.76	1.200	37
Availability and supplies of labour	11	40	21	27	4	2.74	1.084	38
Method of construction	26	18	30	24	5	2.65	1.226	39
Zonal rates Market condition	26	16	38	16	7	2.63	1.213	40
Type of project	23	22	34	15	7	2.61	1.191	41
Type of bidding	26	19	39	18	1	2.50	1.084	42

Source: field survey, 2017

From the Table 3 above, the risk factor whith the highest occurence is "Unforeseeable changes in materials prices". This is followed by "Under-estimation", "Market condition",

"Lack of skilled labour", "Client's change/changes in owner's requirements", "Changes in cost planning data", "Defective design and specification", "Little or no information about M&E services", "Expertise of consultants", "Project scope", and "Increase in duration of the project" . These represent the top 11 risk factors that occur in construction projects in Nigeria amongst the 42 risk factors. The positions of the eleven factors does not come as a surprise as changes in materials prices has become a critical issue and have no control in Nigerian. Under-estimation was ranked 2nd by the respondents as a factor with high occurrence. Under-estimation in technical terms means "forecasting errors", i.e., in terms of imperfect techniques, honest mistakes, inadequate data, inherent problems in predicting the future, lack of experience on the part of forecasters, etc. (Ascher, 1978; Flyvbjerg et al., in press; Morris & Hough, 1987; Wachs, 1990) cited in (Flyvbjerg et al., 2002). Few would dispute that such factors may be important sources of uncertainty and may result in misleading forecasts. It can be deduced that this factor has high level of occurrence in the budget performance.

The risk factor that was ranked 3rd by the respondents is 'market condition'. Circumstances found in the property market, including issues that have to do with resources of the project within the budget /contract period, resulted in significant importance as perceived by the respondents. This may not be a surprise, because of the extended period of budget and contract period for most construction projects. The finding justifies Akintoye (2000) and Adafin et al. (2016) submissions that market conditions are some of the more significant pre-tender estimating risks in the UK and Newzealand. Meanwhile, market condition is suggested as being a critical risk variable that causes budget overruns generally in construction projects in Nigeria. This was confirmed by Ogunsami and Onukwube (2008).

Lack of skilled labour was ranked 4th by the respondent as a factor with high level of occurrence. Medugu et al (2011) cited in Bilau et al. (2015) stated that that where highly capable personnel is utilized, the impact of skilled labour in the construction industry is very noticeable in it ends products. This is because they are directly involved in speedy realization of construction projects delivery since they are involved in the technical aspect of such contract. However, where qualified skilled labour is involved, it tends to eradicate the concern of low productivity, poor quality, late project completion which often result to conflicts, cost and time overruns. In addition, skilled labour also helps to raise productivity, reduction of accident, increased organization stability, less supervision and flexibility.

Client's change/changes in an owner's requirements has a very significant occurrence budget performance in Nigeria. This factor was ranked 5th by the respondents. These indicated that the accuracy of a budget estimate is highly dependent on the amount of details and information scope available. The scope is a representation of an owner's requirements for function, space and quality of a proposed project (Akintoye, 2000; Trost & Oberlender, 2003; Liu & Zhu, 2007; Odusami & Onukwube,2008). This is a critical risk factor in the UK (Odeyinka, 2010) and Ghana (Ameyaw et al., 2015) and Newzealand (Adafin et al., 2016) which was ranked 1st, 2nd and 4th, respectively. on the other hand, it is considered an important risk factor in Nigeria.

Impact of Risk Factors Affecting cash-in Forecasts

Table 4: shows the result of the analysis of the likelihood of occurrence of the risk factors.

	Respondents' Perceptions							
Risk Factor	1	2	3	4	5	**Mean**	**Std. Deviation**	**Rank**
Lack of expertise in client's organisation	1	14	15	33	40	3.94	1.083	1
Client's change/changes in owner's requirements	3	10	23	42	25	3.74	1.029	2
Under-estimation	3	12	31	22	35	3.72	1.141	3
Method of construction	10	2	26	45	20	3.61	1.122	4
Quality of materials	3	4	43	35	18	3.59	0.923	5
Project team's experience of the construction type	2	10	39	32	20	3.56	0.977	6
Lack of skilled labour	7	5	31	45	15	3.54	1.027	7
Lack of multi skilled supervisor/consultants	6	8	31	41	17	3.53	1.046	8
Defective design and specification	0	10	42	38	13	3.52	0.838	9
Increase in duration of the project	1	17	36	27	22	3.50	1.037	10
Market condition	4	5	47	32	15	3.48	0.938	11
Type of client	2	13	42	27	19	3.47	0.998	12
Government legislation/policy	7	2	51	23	20	3.46	1.046	13
Expertise of consultants	2	22	36	20	23	3.39	1.113	14
Quality of work done	1	9	52	35	6	3.35	0.763	15
Availability and supplies of materials	1	14	41	42	5	3.35	0.813	16
Extent of pre-contract design completion	5	7	51	28	12	3.34	0.945	17
Unforeseeable changes in materials prices	4	29	19	34	17	3.30	1.162	18
Project complexity	2	29	28	27	17	3.27	1.104	19

Type of structure	1	23	40	26	13	3.26	0.980	20
Type and quality of cost planning data	3	24	34	28	14	3.25	1.055	21
Site constraints	2	16	56	18	11	3.19	0.897	22
Quality of information and flow requirements	6	13	43	37	4	3.19	0.919	23
Tender inflation	10	11	46	22	14	3.18	1.109	24
Contract conditions	4	17	46	29	7	3.17	0.923	25
Sustainability of materials used and quality	2	32	28	28	13	3.17	1.070	26
Client's brief	5	32	20	34	12	3.16	1.135	27
Availability and supplies of labour	8	12	47	31	5	3.13	0.957	28
Inadequate cost plan/tender documentation	2	19	51	26	5	3.13	0.836	29
Availability of design information	1	28	40	26	8	3.12	0.932	30
Type of bidding	11	16	33	38	5	3.10	1.071	31
Planning requirements or restrictions	2	33	33	24	11	3.09	1.030	32
Procurement system	8	25	30	32	8	3.07	1.087	33
Unforeseeable fluctuation in labour prices	6	24	39	27	7	3.05	1.004	34
Changes in cost planning data	6	31	26	33	7	3.04	1.066	35
Project scope	9	18	44	25	7	3.03	1.024	36
Project location	21	15	22	32	13	3.01	1.339	37
Type of project	6	36	24	29	8	2.97	1.089	38
Zonal rates Market condition	9	20	46	24	4	2.94	0.968	39
Little or no information about M&E services	27	10	24	31	11	2.89	1.371	40
Legal requirements	3	44	33	15	8	2.82	0.988	41
Tender period	26	22	19	32	4	2.67	1.263	42

Source: field survey, 2017

From Table 4 above, the risk factor with the highest impact is "Lack of expertise in client's organisation". This is followed by "Client's change/changes in owner's requirements", "Under-estimation", "Method of construction", "Quality of materials", "Project team's experience of the construction type", "Lack of skilled labour", "Lack of multi skilled supervisor/consultants", "Defective design and specification", and "Increase in duration of the project". These represent the top 10 risk factors that have impact in construction projects in Nigeria amongst the 42 risk factors. It is not surprised that Lack of expertise in client's organization was ranked 1st by the respondent in Nigeria. Most client do not have knowledge of construction and this is having a major impact in giving their brief during the design stage of the construction projects. This needs to be focused on by the design firms in order to improve the budget performance.

Client's change/changes in an owner's requirements was ranked 2nd by the respondents as a factor with high level of impact on budget performance of construction projects in Nigeria. These indicated that the accuracy of a budget estimate is dependent on the amount of details and information scope available. This is a critical risk factor in the UK (Odeyinka, 2010) and Ghana (Ameyaw et al., 2015) and Newzealand (Adafin et al., 2016) which ranked 1st, 2nd and 4th, respectively. Conversely, it is considered an important risk factor in Nigeria Under-estimation was ranked 3rd by the respondents as a factor with significant impact on budget performance. imperfect techniques, honest mistakes, inadequate data, inherent problems in predicting the future, lack of experience on the part of forecasters are the major causes of this risk factor. (Ascher, 1978; Flyvbjerg et al., in press; Morris & Hough, 1987; Wachs, 1990) cited in (Flyvbjerg et al., 2002). Few would dispute that such the factor is important sources of uncertainty and may result in misleading forecasts. It can deduced that this factor has high level occurrence in the budget performance. The risk factor that was ranked 4th is 'method of construction'. Method of construction has a significant impact on the budget as rated by the respondents. At the project inception the design team need to take this factors in to consideration in order to improve budget performance. The finding justifies Akintoye (2000) was 2nd and controversely was ranked in Adafin et al. (2016) as 11th.

CONCLUSIONS

Within the limitations of the information gathered for this study, mean response analysis revealed that the top 11 risk factors with high level of occurrence include: Unforeseeable changes in materials prices, Under-estimation, Market condition, Lack of skilled labour, Client's change/changes in owner's requirements, Changes in cost planning data, Defective design and specification, Little or no information about M&E services, Expertise of consultants, Project scope, and Increase in duration of the project. The result of this study also revealed the top 10 significant risk factors impacting the construction project budget performance in Nigeria. These include: Lack of expertise in client's organization, Client's change/changes in owner's requirements, Under-estimation, Method of construction, Quality of materials, Project team's experience of the construction type, Lack of skilled labour, Lack of multi skilled supervisor/consultants, Defective design and specification, and

Increase in duration of the project. With this information, design firms will be able to better provide information on the influence of the risks on construction project budgets performance at the time of its preparation. More so, as risk elements are intrinsic in construction projects budgets, the findings of this study will have ramifications for all project types on what is required for their reasonable budgetary performance and delivery. The ressults obtained have variations with those obtained from previous studies from UK, Europe, Middle East and the little in Africa (Akintoye, 2000; Odusami & Onukwube,2008; Odeyinka, 2010; Enshassi et al., 2013; Ameyaw et al., 2015; Adafin et al., 2016). However there is a significant difference in the perception of design team in Nigeria on the likelihood of occurence and impact of risk factors on budget performance.

RECOMMENDATIONS

It is therefore recommended that the design firms in Nigeria should take the eleven (11) risk factors with the highest occurrence and the ten (10) risk factors with the highest impact on "budget" performance in to consideration when developing the budget for construction in order to have good budgetary performance at the end of the projects. It also recommended that future research should be carried out on risk factors affecting budget performance at difference phases of project completion than the ones adopted for this study. This will justify the differences at those phases of project completion possible.

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IMPACT OF WAGE DIFFERENTIALS ON PRODUCTIVITY OF CONSTRUCTION COMPANIES IN ABUJA

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Wages constitute a significant part of the overall cost of operations. In some organizations, wages and salaries constitute over 50% of the operating costs. The 1973 Decree provides that the Ministry of labour and productivity may by Order; direct that an Industrial Wages Board be established. The availability of craftsmen is considered as one of the most critical factors for the effectiveness of the construction industry. Productivity depends significantly on craftsmen but cases of craftsmen turnover is becoming a big challenge to the construction industry. This study aimed at evaluating the impact of labour wages differentials on productivity of medium-sized construction companies in Abuja with a view to suggesting ways of reducing the rate of the differences in the wage of craftsmen in medium size construction companies. Through a survey, a total number of 41 structured questionnaires were administered amongst medium size construction workers and FG craftsmen (carpenter, painter and mason). Descriptive analysis was used to determine the factors responsible for labour- wage differentials in medium size construction companies, using percentages, mean and standard deviation. The findings also revealed that it can be seen that with M.I.S of 4.8 is ranked specialty, technicality, hours of work, success and performance are ranked 2nd 3rd 4th and 5th .Job description responsibilities, credentials, industry or employer, Nature of employment,10,11,12,13,14,and15 are ranked 6th,7th-respectively16,17,18 20 are ranked 16t and 17th respectively. Therefore, the study recommends that experience and skills are the most important factors responsible for wage differential and they should be emphasized upon before employment. Training and re-training should be done often to improve on skills and specialty, adequate awareness on the benefit should also be emphasized upon. The need for other factors responsible for carpenter mason increased output should be researched into, the wages of tradesmen in the FG should be improved upon.

Keywords: Wage differentials, Productivity, Construction Company

INTRODUCTION

The construction industry plays a vital role in the economy of Nigeria and its social development. It provides social infrastructure and a backbone for economic activities; mainly because of its capacity to provide employment on a large scale (Sanusi, 2008). It is expected that this vital role played should ensure job stability, labour retention in addition enhanced worker output; this is hardly the case as a result of inefficiencies in the industry's' operations (Akinyemi *et. al.*, 2014). According to Nwachukwu (2000) and Ogunbameru (2000), "wage and salary administration" refers to the development, implementation and on-going maintenance of a base pay system. The central objective or purpose of wage and salary administration is to provide pay that is both competitive and equitable (Atchison, 2003). Previous researches have addressed issues of labour wages and productivity in the construction industry. Fagbenle *et al*. (2004) studied the impact of non- financial incentives on bricklayers' productivity in Nigeria. The study discovered that sites with and without incentives showed that non-financial incentive schemes significantly improved bricklayers' productive time and these schemes accounted for 6% to 26% of the variations in output between the two sites on block laying and concreting activities measured.

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Aina (2011) assessed the performance of incentive schemes in construction projects in Nigeria. The study concluded that the day work schemes, medical allowance, holiday with pay and job finish are incentive schemes with the highest impact on craftsmen productivity based on project managers' perception, while disability insurance and food canteens are incentive schemes rated as high performing by craftsmen.

Agburu (2012) studied the recent trends in wage and salary administration in Nigeria. Adopting a simple cross-sectional survey method using mostly non-parametric methods, the study found that there has been: (1) unwarranted lags between labour (employee) pay and productivity; (2) huge income differentials between the various levels of government where the employees buy from the same market.

The impact of labour wages differentials on productivity of medium-sized construction companies in Abuja was evaluated by the study. This was achieved by examining the factors responsible for wage differentials among medium-size construction companies in Nigeria; and a comparison of the Federal Government scale of wages for tradesmen and the scale of wages for tradesmen in medium-sized construction companies respectively was carried out.

Factors Responsible For Wage Differentials

According to Olateju (1992), experience and skill of workers is the biggest determinant of pay at the end of the day. Employers look at years of experience as a good indicator of a worker's skill level and productivity. National Policy on MSMEs (2006) provided for inter-**firm differentials.** Differences in quality of labour employed by different firms, imperfections in the labour market and differences in the efficiency of equipment's and supervision result in inter-firm wage differentials. **Education and training:** limit the supply of labour in that they take a certain amount of time to complete and require a certain level of skill. In many cases, people who attend college or training school do not have the time to work a full-time job. **On location the policy provided for** wages for workers in the same occupation, and position which can vary drastically from one state to another. This is usually a function of cost of living (Olateju, 1992). **Credentials:** Professional certifications, licensing and advanced education all contribute to wage disparity within an occupation. Obviously, those with advanced education, professional licensure and industry certifications typically earn more than those without similar credentials (Olateju, 1992). **Job description and responsibilities:** Even within the same occupation, workers may have varying jobs and responsibilities.

METHODOLOGY

Both quantitative and qualitative methods (mixed method) were used since they have a tendency to shade into each other. It is also very difficult to find research works that do not include both numbers and words (Blaxter *et al*., 2006),

Quantitative research by definition, measurement must be objective, quantitative and statistically valid. Simply put, it's about numbers and objective hard data. The sample size for a survey is calculated using formula to determine how large a sample size will be needed from a given population in order to achieve findings with an acceptable degree of accuracy.

Data was collected from both primary and secondary sources. Data on the Federal Government (FG) and the medium-size construction companies' scale of wages for the tradesmen was obtained from the record published and kept by the FG and medium-sized construction companies (Archival Data) and this constituted the secondary data for the study. The factors responsible for wage differentials in medium-size construction companies as well as the strategies for reducing these wage differentials were identified from extant review of literature and examined using questionnaire and this constituted the primary Data. The questionnaire consisted of four parts namely;

- General information of respondents.
- Factors responsible for wage differentials in medium-size construction companies.
- Information on company wages per year.
- Information on company wages per day.

For the purpose of this study, population comprised the construction companies registered with the Federation of Construction Industry (FOCI) comprising medium construction company registered in category D with the Federal Ministry of works.

The research was conducted in Abuja, the capital city of the nation because it is the major centre of construction activities and concentration of medium sized construction companies. And most practitioners have either their head offices or regional headquarters in the capital city. The study's population was 85 while the sample size was 41. This is based on Dorothy (2008) sample size computation.

Table 1: Factors Responsible for Wage Differentials among Medium-Sized Construction Companies

S/No.	Factors Responsible for Wage Differentials	MIS	St. Dev	Rank	Decision
1	Experience and skills	4.8250	0.3800	1st	Most Important
2	Specialty	4.0250	0.7579	2nd	Very Important
3	Technicality	3.8500	0.7263	3rd	Very Important
4	Hours of work	3.6750	0.8182	4th	Very Important
5	Success and performance	3.6250	0.6591	5th	Very Important
6	Job description responsibilities	3.4500	0.8352	6th	Fairly Important
7	Credentials	3.2000	0.6782	7th	Fairly Important
8	Industry or employer	3.1750	0.5426	8th	Fairly Important
9	Nature of Employment	3.1500	0.5723	9th	Fairly Important
10	Occupational differences	3.0000	0.7071	10th	Fairly Important
11	Regularity of employment	2.8500	0.6910	11th	Fairly Important
12	Immobility of labour	2.7250	0.8363	12th	Fairly Important
13	Location	2.6750	0.6476	13th	Fairly Important
14	Political and social environment	2.6000	0.7000	14th	Fairly Important
15	Scope for extra earnings	2.5750	0.7710	15th	Fairly Important
16	Inter industry differences	2.3500	0.4770	16th	Less Important
17	Profitability difference	2.2000	0.9000	17th	Less Important
18	Compensation differentials	2.1500	0.5268	18th	Less Important
19	Insider / outsider privilege	1.9000	0.4899	19th	Less Important
20	Discrimination	1.7250	0.8058	20th	Less Important

Source: Researcher's Analysis of Data (2017)

From Table 1, factors which were also very important and ranked 2nd to 5th with MIS ranging from 0.6591 - 0.7579). The next nine (9) factors were shown to be fairly important. These range from job description responsibilities (MIS = 3.4500) to scope for extra earnings (MIS = 2.5750). The last five factors, as shown on Table 4.1, are of less importance. These are Inter industry differences (MIS = 2.3500), Profitability difference (MIS = 2.2000), Compensation differentials (MIS = 2.1500), Insider / outsider privilege (MIS = 1.9000) and discrimination (MIS = 1.7250).

From Table 4.1 it can be seen that with M.I.S of 4.8 is ranked specialty. Technicality, hours of work, success and performance are ranked 2nd 3rd 4th and 5th. Job description responsibilities, credentials, industry or employer, nature of employment,10,11,12,13,14, and 15 are ranked 6th,7th to 15 respectively are ranked 6th,17,18,19,20.

DISCUSSION

According to Morenikeji (2006), it can be said that experience and skill having M I S of 4.8 is the most important factor to medium sized construction companies in Abuja. It can also be seen that the specialty 2,3,4,5 are very important; 6, 7, 8 are important factors while 16, 17,18,19,20 are fairly important factors to medium sized construction companies.

Obitayo (1991), stated that skill and ability are a result of experience. It was further stated that workers with both experience and in-demand skills usually come more than workers in the same occupation thereby making this factor most important to medium sized construction workers.

CONCLUSION AND RECOMMENDATIONS

The study revealed that the most important factor responsible for wage differentials among the medium sized construction companies in Abuja is experience and skills while discrimination and insider/outsider privilege are less important factors. It was also revealed that other factors are responsible for higher output of the carpenters but not wages, so also for the masons the null hypothesis were accepted but for the painters, output increase as wages increase thus the null hypothesis is rejected. It was further revealed that there is a difference between wages paid to different tradesmen, there was no statistical significant difference between them, and thus the null hypothesis was rejected.

From above, it can be concluded that experience and skills is the factor that determine the difference in payment of wages of workers in medium sized construction companies in Abuja. This means that if a worker is experienced and skilled, he is likely to be paid better that a less experienced and skilled counterpart. Based on the findings, the study hereby recommends that:

I. Since experience and skills are the most important factors responsible for wage differential this should be emphasized upon before employment.

II. Factors responsible for increase carpenter and mason output be researched into.

III. Training and re-training should be done often to improve on skills and specialty.

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EVALUATING THE PERFORMANCE OF PUBLIC PRIVATE PARTNERSHIP IN THE DELIVERY OF PUBLIC HOUSING SCHEMES IN NORTH CENTRAL NIGERIA

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Public Private Partnership (PPP) has been defined as a mutual scheme between the public and private sectors, built on the expertise of each entity that perfectly meets evidently defined public requirements through the applicable sharing of resources, risks and profits. PPP was proffered as a resort delivery option as against the traditional method for procurement of infrastructure such as housing and road projects in both developed and growing countries. It is anticipated that projects executed through PPP should meet cost and time requirements of the stakeholders involved. The problem noticed therefore, is that PPP is being engaged at various levels to develop housing schemes in North Central Nigeria but its performance in terms cost and time has not been termed satisfactory to the parties involved. The aim of this research is to evaluate the performance of Public Private Partnership in the delivery of public housing schemes in North Central Nigeria through understanding the principles of PPP, evaluating the cost and time performance of PPP and developing a framework for PPP for public housing delivery. Survey approach was used for this research work because of the broad population. Non-probability sampling technique was employed as well as primary and secondary sources of data. The research method adopted is stratified sampling with the use of structured questionnaire. Descriptive statistics such as Mean and Standard Deviation was engaged to solve the research inquiry. The results reveal that PPPs is a rapidly growing means of developing public housing schemes and PPP is continuing to be developed to suit the needs of housing schemes due to demand for infrastructure. It also shows that cost and time overruns sometimes experienced in PPP housing schemes are influenced by the private sector and, public and private sector requires a structured and programmatic approach such as a framework to promote the effective, efficient and sustainable delivery of the PPP programme. In conclusion, the study developed a framework for public housing delivery through PPP.

Keywords: Public Private Partnership (PPP), Infrastructure, Public Housing Schemes, North Central Nigeria

INTRODUCTION

A growing country like Nigeria, with dwindling resources, creation of needed infrastructure such as housing, establishment of job chances for our vibrant youths and uncertainties among other factors are problems of the nation's interest which have been a special task for our government. Aside from dwindling resources, budgets are equally not enough to finance needed operating services, such as low maintenance of existing infrastructures, not to talk of embarking on the creation of fresh ones. This growth has placed a herculean task on the ability of government to deliver its social responsibility of providing needed infrastructures (Ajanlekoko, 2001; Jimoh *et al.* 2015). In Nigeria, at the Federal level, various initiatives that adopt the efforts at the State and Local Government levels have been channelled at strategizing the part of the government in overseeing its buildings and properties. To deliver on these fiscal needs, Federal agencies are increasingly focused in overseeing structures in a more profit-making approach, including venturing the synthesizing of partnerships between the Federal Government and the private body. This is to reduce the dependence on National budget which is a typical characteristic of the traditional method of procurement (Federal Ministry of Power Works and Housing, 2016).

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Khaled *et al.* (2014) highlighted that there has been minimal infrastructure strategy or setting up for housing in a lot of the growing nations. Housing deficit is not totally tackled, because of the rise in housing request. Ogunsanmi (2012) opined that traditional method of obtaining contracts has being a long time procedure which has revealed great uncertainty of late finish of construction works as established by various researches and sometimes leads to duration escalation.

Public Private Partnership (PPP) is greatly used in various nations to involve the non-government body in instances where government authorities and agencies formerly control because it is now known as a major provider to aiding the nation get workable country growth. The momentum and extent of the needed growth of the nation might have put burden on current skills and assets on ground to get such motivated focus making use of more traditional procuring processes (Dulaimi *et al.* 2010)

Public–private partnership (PPPs) was proffered as a resort delivery option for procurement of infrastructure such as housing and road projects in both developed and growing countries. One of the reasons governments are resorting to PPP in construction project delivery is to enable them tap from the required skills, inventions and managerial capability of the private body to optimize efficiency especially in procurement of infrastructure projects (Aziz 2007; Laishram and Kalidindi 2009).

As the housing deficit in Nigeria has been noticed, several hard works had been embarked upon by continuing authorities in seeing to this challenge. The Government of Niger State had looked for a way in curbing this shortcoming by carrying out erection of large scale housing; among the programmes are the 500 M.I Wushishi housing estates in Minna with the aid of collaboration with non-government entities (Jide, 2010; Jimoh *et al.*, 2015).

Despite several intercessions carried out by the authorities to include the non-government organizations to partake in amenities development/sheltering, the challenges posed by housing shortage is still a severe job still to be tackled by the authorities. (Jimoh *et al.*, 2015)

Wibowo and Kochendoerfer (2011) pointed out that lots of governments, especially in growing economies, are often in want of financial resources needed for building fresh and sustaining existing infrastructure facilities. Affected by low efficiency and little or no transparency in their management, poor quality infrastructure service to the settlement is cannot be avoided.

The public service in Nigeria is in a serious situation, for the reason that it is not up to the requirements of the funding party; it prevents venture capital and shoots up the price of carrying out commercial intentions in the nation (FGN, 2004; Iloh and Muktar, 2013).

The task of delivering housing infrastructures using traditional method among other shortcomings is huge responsibility placed on Government as the sole risk taker and financier and, have necessitated many government of the world including Nigeria to move towards alternatives such as PPP. The recent economic recession in Nigeria has led to drastic reduction in budgetary allocation for government funded projects and is considering other alternatives such as PPPs to enhance timely delivery of projects within acceptable cost and risk reduction and quality guaranteed. The public sector which has been finding it very difficult to create, implement and sponsor effective and efficient housing delivery policies in Nigeria have lots of services to be delivered to the citizenry but with very few resources. However, becoming aware of the fact that private home owners and rental housing sector have been and will continue to be the significant creator of the large chunk of housing in the country, the Nigerian Government not too long ago imbibed public private partnerships through restructuring the housing aspect in the new National Housing Policy of 2006 as a policy structure for encouraging private sector participation on the housing delivery (Aluko, 2009; Olofa and Nwosu, 2015).

LITERATURE REVIEW

Contract Procurement in the Nigerian Construction Industry

Alabi (2000) observed that contract procurement methods are defined as the process of procuring drawings and the development of a structure or amenity from briefing through to design, construction, commissioning and subsequent occupation.

Shwarka and Anigbogu (2012) discussed that procurement systems in Nigeria have become an area of increased public interest, in part because of the need to obtain the most advantageous pricing and contractual conditions and work quality and also due to increase need to ensure probity and accountability in public procurement. The procurement process is normally considered to start from the completion of design to the successful commissioning of the assembly of building. They also suggested that several systems of procurement have been introduced over the years in the quest for better project performances. These include the different variants of the separated, integrated, management and discretionary procurement systems. It is important for public clients to determine the right procurement system after assessing the stage of client involvement needed in the construction project, the strategy to design solutions, the time available for construction and the method of funding the project. The choosing of suitable procurement method has to highlight the magnitude, difficulty, uncertainties involved, economic situations and employer's needs to make certain proficient infrastructure provision.

With the modern contract obtaining techniques, there is a gradual shift from merely getting employer's requirements to sharing of risks, as developers are steadily assuming their position as venture firms with the focus of getting maximum gains with lesser uncertainty, and it has resulted to the growth of incorporated strategies of contract obtaining which are combinations of conventional and modern contract obtaining modes (Babatunde *et al.*, 2010). Aluko (2000) opined that contract procurement in Nigeria has always been developed to meet the contractual needs of basically the clients and the other participant needs ranges between arriving at a realistic completion time and cost through a healthy relationship among the participants.

There exist a wide range of procurement methods in Nigeria such as the Traditional method, Management Contracting, Construction Management, Design and Management Contract and, Public Private Partnerships.

Concept of Public Private Partnership in Construction Procurement

Morley (2002) noted the concept Public Private Partnership procurement system is that which is collaboration among the public and private sector to provide huge financial gulping infrastructural project making use of private money which the expended fund is recouped from the money derived by the exploitation of the finished facility over a timeframe of specified years. It signifies the pivotal role played by the conjunction of the public and private sectors which is different from privatization.

Australian Government Department of Infrastructure and Regional Development (2015) pointed out main factors in the usage of PPPs as Value for capital; General public concern; Optimal risk sharing; Productivity oriented; Clearness; Accountability; Involving the consumers; Upgraded funding and financing and; Sustainable long-term contracting.

Nnachi (2011) discussed that Public-Private Partnership (PPP) or P3 in infrastructure growth in Nigeria involves private entity involvement in any or all of the design, construction, and financing and operation stages of a public utility infrastructure, service or a combination of both. PPP entails an agreement between a public body and a private entity, of which the private organization develops a public utility or infrastructure and takes up significant sponsoring, procedural and active risk in the task.

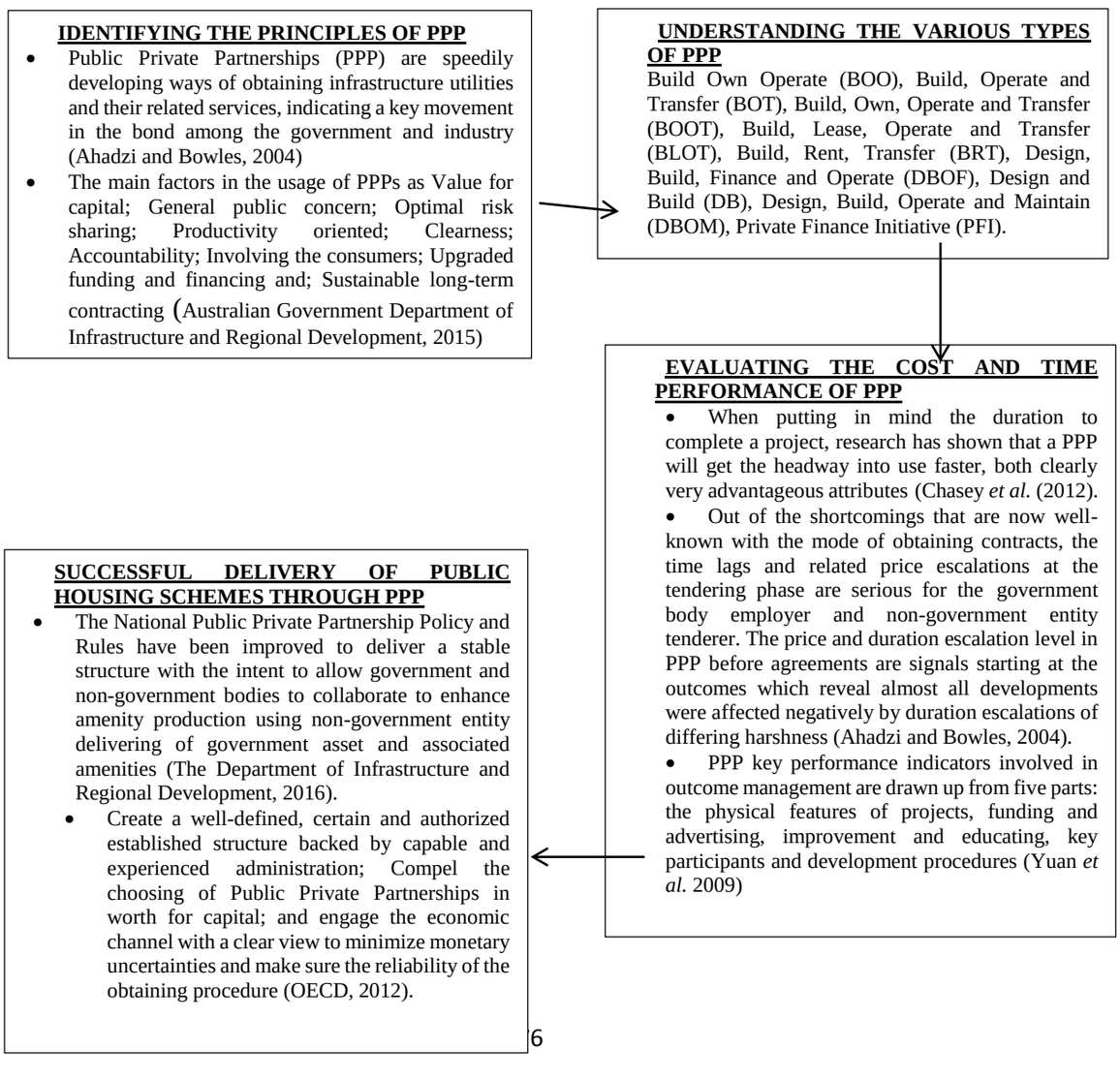
The PPP idea is greatly being adopted by lots of nations and backed by a considerable figure of worldwide establishments/ministries. Significantly noted are countries like the USA, the United Kingdom, Canada, Australia, South Africa, Japan, Finland, the World Bank, the European Investment Bank and the United Nations (Brook; 2001; Hamilton, 2001; Kouvarakis, 2001; The PFI Report, 2001; Ahadzi and Bowles, 2004). The whole PPP obtaining procedure may be categorized to four distinct segments; which is the setting up

and viability segment, the request and discussion segment, the development segment, the running phase and if need be, the transmission and/or a start-all-over again segment (Ahadzi and Bowles, 2004).

Herpen (2002) noted that a public private partnership could be discussed as a combined effort among the public and the private industry, in which the government body and the private entity execute a project together on the grounds of an agreed sharing of labour and risks, each party holding unto its own identity and roles. The perceived demand in PPPs is rising, notably as a result of the increase in the requirement for infrastructure, reducing public funds to cater for current and future needs and acceptance for the non-public institutions in the provision of community projects. The key understanding behind PPPs is that, though the public sector may be required to be responsible for the provision of a particular service/infrastructure, it does not have to be responsible for really delivering the service or for carrying out the investment themselves. With this method, all participants of a public private partnership can give full focus on carrying out what they are likely to do best.

Public private partnership (PPP) is greatly made use of in lots of nations to absorb the private bodies in situations only public agencies and government bodies initially carried out tasks. The idea is somehow not common to the United Arab Emirates (UAE) in a place the government undertakes the obligation for delivering most of the public utilities. So far, the private industry in the UAE has failed in performing a vital part in delivering public infrastructures as shown by the minute collaborations and joint agreements entered into by the public agency and the private entity channelled at delivering public utilities. Of recent, the consumers have seen quite several efforts to ameliorate this circumstance. A key frontier is government of the United Arab Emirate concept to trim the public agencies and create awareness for more valuable PPP (Ghazal 2008; Dulaimi *et al*. 2010).

Figure 1: Conceptual framework for the delivery of public housing schemes through PPP



The Need of Public Private Partnership in the Delivery of Public Housing Schemes

Daramola *et al.* (2005) explained that the bringing on of private and public comprehensive responsibilities in the infrastructural (housing) market was largely backed up by the worldwide market accessible trade well referred to as the world trade organization (WTO). Steps of worldwide involvement, which brings about continuous increase of associations and all-round connections all over the global space, introduced this method. Worldwide firms such as the World Bank, International Monetary Fund and WTO have continuously forced growing quantity of encouragements on various countries relations. Improving cross border impacts with socio-political governance firms of large figure nations already exists.

It was in search of alternative procurement methods that brought the idea of PPP in the procurement of public building and infrastructure projects in Nigeria (Sanda *et al*. 2016). The PPP ideology is relatively not common in Nigeria and other developing countries; however, its application gaining popularity in among developing countries (Adeogun & Taiwo, 2011, Sanda *et al*. 2016).

The creation of the National Housing Policy (NPH) in beginning of 1990s and its further review in beginning of the millennium gave an explosion to organized private sector (OPS) to take a place in the delivery of housing in the country (FGN, 1991; 2006; Abdullahi and Abd Aziz, 2010). Quite a number of laws, motivations, structures and plans are drawn and carried out through the years to establish robust OPS in infrastructure (housing) aspect of the nation and authority to settle down to a state of implementer. Amongst these are establishment of industrial frameworks; start-up of funding organs; reformation, strength formation and monetary rearrangement of funding agencies; examination of policies and statues to ensure they are proficient and should be enacted, forming of fresh departments and establishment, development and skilfulness of the OPS in housing sector (Fortune-Ebie, 2006; Abdullahi and Abd Aziz, 2010).

Rufai (2010) discussed that Public – Private partnership in housing ensures systematic and speedy development of houses and its associated components to the people. It takes care of the possibility of having uncompleted or totally abandoned housing projects that were the usual case of conventional practice. Collective actions lead to sharing of knowledge, ideas, skills and financial resources. The importance of PPP is: it is bound to ensure the provision of shelter or housing to greater proportion of Nigerians, it improves easy access to home ownership through the mortgage system of home-ownership, Public – private partnership in housing and urban development can be an important factor in the security and safety of cities through the involvement and the commitment of all stakeholders and, PPP projects carries all those involved in the scheme together.

Types of Public Private Partnerships

According to Zakari (2007) the PPP can come in several modes and methods depending on the target and objectives of the partnership, the variant, nature and characteristics of the stakeholders/participants and the beneficiaries; the type of contractual agreement and policies imbibed, and a clearly defined allocated responsibilities and means of financial and material support to ensure development, sustenance and better return on investment.

Leiringer (2005) opined that the definition of PPP looks at the context of the most usual contractual procedures employed on PPP developments such as Build, Operate and Transfer (BOT); Build, Own, Operate and Transfer (BOOT); Build, Transfer and Operate (BTO); Design, Build, Finance and Operate (DBOF) and; Design, Construct, Manage and Finance (DCMF).

The general procurement method for privately funded developments are: Build operate and transfer (BOT) and Build on Operate and Transfer (BOOT). Other derivate and abbreviations employed to explain concession contracts are: DBFOT; (Design, Build, Finance, Operate Transfer), FBOOT; (Finance, Built, Own and Transfer), BOO; (Build Own Operate), BOL; (Build Operate Lease), DBOM (Design, Build, Operate and Maintain), BOD; (Build,

Operate, Deliver), BOOST; (Build, Own, Operate, Subsidies Transfer), BRT; (Build, Rent, Transfer) and BTO; (Build, Transfer, Operate). (Omole 2001; Mac-Barango 2015)

Cost And Time Performance Of Public Private Partnership Procurement

Raisbeck *et al.* (2010) opined the terminology PPPs as a contract procuring alternative which has to be provided to the Australian policy creators in the scenario government funds is dwindling and development magnitude is important. The Australian authority suggests that risks sharing in the context of PPP settings are not usually involved in price escalations and entitlements. When empirical and measurable statistics point out that tendering and its prices are truly costing more in the context of PPPs, this could be too high for the contractors to bear. It may also give explanations as to the reason Australian developers may choose traditional contract procuring method if the uncertainty–profit detail from traditional procuring method is viewed to be potentially of benefit.

According to Chasey *et al.* (2012), Public Private Partnerships do not serve as a final solution. Also, there are lots characteristics of a project's development that feed into its achievement than just the observation of cost and schedule point of view. Pertinent to the fact that every PPP researched took into consideration the characteristics of a design and build construction contract within it, it can be concluded that the involvement of design and build as a method to contract for the construction of complex projects caters for costs better than a design-bid-build (traditional) construction. Further, when putting in mind the duration to complete a project, research has shown that a PPP will get the headway into use faster, both clearly very advantageous attributes.

The Allen Consulting Group (2007) noted that PPP ambassadors argue that greater design freedom exists, raised incentives to motivate, more chance for partnership work and a more efficient sharing of uncertainties between parties in the PPP model. PPP critics argue that there are no merits and that there are escalated costs related with PPPs such as tendering costs and uncertainties compounded by a noticed absence of transparency in the PPP mechanism. Arguably, many of the problems that are seen as plaguing PPPs are also needed to projects carried out by governments using the Traditional models of procurement.

Walker *et al*. (2015) opined that joint ventures are applicable and turns out to be a success within particular defined situations. They can be costly to start with, coupled with difficult interfaces and are most applicable to construction projects where there is magnanimous uncertainty and undefined large choice, as a result the development obtaining requirements has to be fully digested by the Project Owner/Project Owner Representative and Non-Owner Participants in alliance. The collaborating party should be competent to execute tasks in the context of deeply agreed esteem, confidence and obligation. Flexibility is needed to change plans with a view to achieve infrastructural development objectives, without recourse to unwanted suspicions and conflicts. The requirements of this professionalism that is usually not typical and very hard to get. A 'quality for development' mechanism falls on the project party commending that excellent lengthy duration productions will better coming dealings.

Ahadzi and Bowles (2004) indicated that the importance of construction works gotten using PPP modes of contract obtaining is rising globally, as authorities want to include non-government body funds and mechanisms of execution in the delivery of varieties of amenities. Out of the shortcomings that are now well-known with the mode of obtaining contracts, the time lags and related price escalations at the tendering phase are serious for the government body employer and non-government entity tenderer. The price and duration escalation level in PPP before agreements are signals starting at the outcomes which reveal almost all developments were affected negatively by duration escalations of differing harshness.

Common views in international PPP literatures shows that co-ordination of construction projects through the use of PPP method betters the time completion compared with traditional procured projects, which have a negative record (Grimsey and Lewis 2005; Li *et al*. 2005, Kwak *et al*., 2009; Carpintero and Petersen 2014).

Findings from a research conducted by Ling and Leong (2002) also reveal that most employers, designers and contractors generally assert to the fact that PPP projects, especially the Design and Build (DB) can be executed in a shorter duration. The key motive for this is contractors' early inclusion in the project, giving them the chance to add input to the design

leading of the construction process. However, the shorter construction time is irrelevant to some degree by the longer timeframe used by employers in the pre-contract stage.

Developing a Framework for PPP for Delivery of Public Housing Schemes

APM Group (2017) suggests that Governments should adopt a structured and programmatic approach such as a framework if they want to rely significantly on the PPP model for new infrastructure development. This is a way to attract stronger and more consistent interest from the private sector. The PPP framework should aim to promote the effective, efficient and sustainable delivery of the PPP program in the jurisdiction. PPP program objectives that will give designers of the framework the direction needed to formulate appropriate processes, decision criteria, and institutional responsibilities can include the following: Allowing enough venture in assets by raising development sponsoring alternatives; Getting worth for funds in the delivery of assets and community amenities; Enhancing responsibility in the delivery of asset and community amenities; Exploiting non-government entity advancement and proficiency; Ensuring that the long-term delivery and management of PPPs is sustainable, especially when stakeholders change over time (political actors, champions, representatives in ministries or PPP units); and Stimulating growth and development in the country.

The National Public Private Partnership Policy and Rules have been improved to deliver a stable structure with the intent to allow government and non-government bodies to collaborate to enhance amenity production using non-government entity delivering of government asset and associated amenities (The Department of Infrastructure and Regional Development, 2016).

Australian Government Department of Infrastructure and Regional Development (2015) noted that a main point in successful procurement of infrastructure and related services is that it comes before an integrated approach to key infrastructure planning and robust frameworks for conclusions to invest in infrastructural development, including the use of project examination methodologies such as thorough cost benefit analysis.

The successful start-up of PPPs demands an institutional and regulatory framework that is functional and allows projects to be finished so that the advantages of increased private sector participation and improved service delivery may be achieved (Ministry of Finance and Development Planning Botswana, 2009).

Asian Development Bank (2012) posits that PPPs are separately regulated by the contract that spells out the roles of parties involved (off taker and/or grantor, and the private sector and/or concessionaire). The contract spells out the procedure, time, and under what conditions the private sector would be due to receive reimbursements (at intervals as well as termination) and how any indexation of payments would be created.

Authorized framework for PPPs relates to the statutes, acts, rules, regulation, and administrative processes that oversee the particular sector/project. This framework describes the rights and responsibilities of the various key participants in the PPP therefore, the uncertainty sharing and apportionment to each of the parties involved. Essential features of legal framework for a PPP project include: Comprehensiveness of rights; Acceptable to erect, sketch, construct, possess, control, manage, and upkeep the infrastructure facilities; Right to fully know, gather, retain, and appropriate tariffs from the consumers of the infrastructure facilities. A large variety of institutional framework and capacity modes have now been imbibed for determining and obtaining PPPs around regions and key/main departments, distinct types of that have possessed a quantity of levels of achievements. At the region phase, the three main mechanisms have been: joining dedicated institutions with cross-cutting legislation; creating and using cross-sectorial PPP advisory modules to help line departments where there is no overarching legislation; and basing on line departments and sectorial agencies to develop capacities (Government of India, 2012).

RESEARCH METHOD

The states selected for this research include Benue, Nasarawa, FCT and Niger because of the presence of on-going and completed PPP projects as well as professionals vast in the

knowledge of PPP. Sampling frame for this study basically consists of construction professionals, consultants, government/ public and private firms in PPP procurement projects. The population is clustered into four states from North Central Nigeria (Benue, Nasarawa, FCT and Niger) in which stratified random sampling were employed to pull out the respondents from the clustered areas. These consists of 28 Quantity Surveyors, 22 Architects, 23 Engineers, 12 Builders, 15 Project Managers and 18 Contractors (a total of 118 which serves as the entire sample size adopted). Quantitative approach was employed to collect data and it shall include the use of questionnaires to be distributed to professionals engaged to handle PPP projects in North Central Nigeria. It will be structured in a pattern for collecting statistics and elicits feedbacks or facts from respondents on the research work. The questionnaire was segmented in a pattern that the respondents are required to pick from the remedy given by ticking appropriately. The questionnaire aimed to highlight the key areas of curiosity to the investigator and at such giving important facts to the investigation objectives. An expanse variety of literature examination from journals, articles, Internet surfing, and other professional materials was employed to gather facts from the subordinate supply.

Descriptive statistics such as mean and standard deviation will be engaged to solve the research inquiry while the results are presented in tables and figures. The cut-off point of 2.50 and above was considered accepted while 2.49 and below will be considered not accepted for the answers to the items on the instrument.

RESULTS AND DISCUSSION

As earlier noted, sample size for the study were 118. Accordingly, 118 questionnaires were sent but 110 returning. Hence, the percentage returned is 93% showing reasonable high percentage.

Table 1 Percentage of Questionnaires Returned and Not Returned

Questionnaire	Number	Percentage
Distributed	118	100
Completed and returned	110	93
Not Returned	8	7

Table 1 shows the response rate of respondents in the study. As shown in this Table, out of a total of 118 questionnaires distributed, 110 (93%) were completed and returned, while the remaining 8 (7%) were not returned. The outcome of a survey could be taken as biased and of little significance if the rate of return was lesser than 30-40%, the number of questionnaires completed and returned were therefore considered adequate for analysis.

Table 2 Designation of respondents

Designation	Number	Percentage
Architecture	23	21
Quantity Surveyor	45	41
Builder	30	27
Engineer	12	11
Total	**110**	**100**

Table 2 shows the designation of respondents in the study. As shown in this Table, 23 are architects (21%), 45 are quantity surveyors (41%), 30 are builders (27%) while 12 are engineers (11%). This implies that there are sufficient professionals to proffer answers required for the research.

Table 3 Academic qualification

Academic Qualification	Number	Percentage
HND	35	32
B.Sc./B.Tech	53	48
M.Sc./M.Tech	14	13
Ph.D.	8	7
Total	**110**	**100**

Table 3 provides information relating to academic qualification. As shown in the table, 32% of the respondents had HND, 48% of the respondents had B.Sc./B.Tech, while 13% and 7% had M.Sc. / M.Tech and PHD respectively. The result implies that the respondents are academically qualified to give information to the research questions.

Table 4 Professional qualification

Professional qualification	Number	Percentage
NIA	18	15

NSE	10	9
NIQS	32	30
NIOB	27	25
Total	**87**	**79**

Table 4 provides information relating to professional qualification of respondents for the study. As shown 15% of the respondents had NIA, 9% had NSE, while 30% and 25% had NIQS and NIOB respectively. The result means the respondents are professionally qualified to give research input.

Table 5 Years of working experience

Working experience	Number	Percentage
0 – 5 years	13	12
5 – 10 years	27	25
11- 20 years	10	9
21 – 30 years	11	10
31 – 40 years	18	16
41 and above	31	28

As shown in table 5, 12% of the respondents have 0 -5 years working experience, 25% have 5 -10 years working experience, 9% have 11 – 20 years working experience, while 16% and 28% have 31 – 40 years and 41 and above years working experience respectively. This means the respondents have adequate number of years of experience required for giving information in the research field.

Table 6 Projects involved

Projects involved	Number	Percentage
0 - 5	42	38
5 - 10	24	22
11 - 20	15	14
21 to 30	13	12
31 – 40	8	7
41 and above	8	7

Also, as shown in the Table 6, 38% of the respondents had been involved in projects within last 5 years, 22% of the respondents had been involved in projects within 5 – 10 years, 14% of the respondents had been involved in projects within 11-20 years, 12% of the respondents had been involved in projects within the last 21 – 30 years while 7% and 7% had been involved in projects within the last 31 – 40 years and 41 and above years respectively. This shows that the respondents are involved in sufficient number of projects in relation to the research work.

Table 7 Projects executed using the public private partnership

Projects Executed	Number	Percentage
0 - 5	18	16
5 - 10	61	55
11 - 20	12	11
21 - 30	5	5
31 - 40	8	7
41 and above	6	5

In Table 7, 16% of the respondents had been involved in executing projects using the public private partnership within last 5 years, 55% had been involved in executing PPP projects within 5 – 10 years, 11% of the respondents had been involved in executing projects using the public private partnership within 11-20 years, 5% of the respondents had been involved in executing projects using the public private partnership within the last 21 – 30 years while 7% and 5% had been involved in executing projects using the public private partnership within 31 – 40 years and 41 and above years respectively. This implies the respondents are adequately involved in PPP projects to give information required for the research.

Based on the foregoing information about the respondents to the study, it is reasonable to conclude that reliable information was derived for the study. Since majority of the respondents did not only belong to consultancies which are actively involved in the

construction industry activities, but also belong to top management in their respective firms, with a relatively high number of years of experience.

Table 8: Principles of PPP in construction procurement

Table 8 shows the extent of agreement of the principles of PPP in construction procurement. As shown in these tables, respondents ranked PPPs as a rapidly growing means of developing public housing schemes and PPP is continuing to be developed to suit the needs of housing schemes due to demand for infrastructure as the two most important concept of PPP in construction procurement.

Item No	Principles Guiding Ppp In Procurement	Mean (X)	Std	Rank
1	PPPs are a rapidly growing means of developing public housing schemes	3.84	0.14	1
2	PPP is continuing to be developed to suit the needs of housing schemes due to demand for infrastructure	3.82	0.19	2
3	The use of PPP is always as a result of the public sector not having adequate capital in providing public housing	3.76	0.25	3
4	The entire PPP procurement process comprise four main stages: the planning and feasibility phase, the bidding and negotiation phase, the construction phase, the operation phase and possibly the transfer and/or renegotiation phase	3.75	0.29	4
5	The use of PPP in developing housing schemes have improved the relationship between the public and private sectors	3.56	0.25	5
6	PPP procurement forms are only for high capital intensive infrastructural project	3.53	0.58	6
7	Under the principle of PPP, the public sector is being converted to purchasers of services while the private entity becomes long time provider of such services	3.42	0.46	7
8	The PPP concept is greatly being accepted and supported by many states in North Central Nigeria	3.4	0.24	8
9	The private entity is solely responsible for financing the project	2.87	1.02	9
10	The public and private sectors work together from the design to the construction and operation of the facility	3.23	0.5	10
11	The public sector does not have to be responsible for actually providing the service or for undertaking the investment themselves	2.85	0.59	11
	Cluster Mean	**3.46**	**0.41**	

The cluster mean and standard deviation are 3.46 and 0.41 respectively; since the cluster mean is above 2.5, hence it is accepted. It should be noted that if it is below 2.5, it will be rejected.

Table 9: Reliability Statistics

Cronbach's Alpha	Cronbach's Alpha Based on Standardized Items	N of Items
0.897	0.914	11

Table 9 shows the cronbach's alpha computed to measure the internal consistency among ratings of respondents and thus the Cronbach alpha was very close to one, indicating the scales used were reliable and the respondents understood the questions being put forward to them.

Table 10 shows the extent of agreement of cost performance of PPP procurement. As shown in these tables, respondents ranked Cost overruns sometimes experienced in PPP housing schemes are influenced by the private sector and Cost performance of PPP procured projects have effect on the whole lifecycle of the infrastructure as the two most important cost performance of PPP procurement.

Table 10: Cost performance of PPP procurement

ITEM NO	COST PERFORMANCE OF PPP PROCUREMENT	MEAN (X)	STD	Rank
1	Cost overruns sometimes experienced in PPP housing schemes are influenced by the private sector	3.71	0.35	1
2	Cost performance of PPP procured projects have effect on the whole lifecycle of the infrastructure	3.69	0.21	2
3	High bidding costs, delays and lack of transparency are more common when PPP is used to deliver public housing	3.52	0.63	3
4	Proper risk allocation under PPP arrangements are less subject to cost overruns and claims	3.48	0.58	4
5	The use of PPP helps in the reduction of government's debt profile when delivering public housing	3.46	0.47	5
6	PPP contractors involve value engineering to minimize costs without lowering quality	3.38	0.67	6
7	The use of PPP helps government in development and delivery of infrastructures such as public housing schemes	3.35	0.74	7
8	Cost overruns sometimes experienced in PPP housing schemes are influenced by the public sector	3.27	0.74	8
9	The use of PPP contains cost better at pre-contract and post-contract stages of housing schemes	3.25	0.51	9
10	Prevailing economic climate (such as recession) has cost effect on PPP procured projects	3.22	0.64	10
11	PPP should be used for large complex and uncertain projects	2.62	1.18	11
	Cluster Mean	**3.36**	**0.61**	

The cluster mean and standard deviation are 3.36 and 0.61 respectively; since the cluster mean is above 2.5, hence it is accepted.

Table 11: Reliability Statistics

Cronbach's Alpha	Cronbach's Alpha Based on Standardized Items	N of Items
0.953	0.976	11

Table 11 shows the cronbach's alpha computed to measure the internal consistency among ratings of respondents and thus the Cronbach alpha was very close to one, indicating the scales used were reliable and the respondents understood the questions being put forward to them.

Table 12 shows the extent of time performance of PPP procurement. As shown in these tables, respondents ranked time overruns sometimes experienced in PPP projects are influenced by the private sector and, increased level of consultation, working together and good channel of information ensures that design differences are tackled quickly in PPP projects as the two most important time performance of PPP procurement.

Table 12: Time performance of PPP procurement

Item No	Time Performance Of PPP Procurement	Mean (X)	Std	Rank
1	Time overruns sometimes experienced in PPP projects are influenced by the private sector	3.15	0.42	1
2	Increased level of consultation, working together and good channel of information ensures that design differences are tackled quickly in PPP projects	3.1	0.47	2
3	Contractors' early involvement in the project especially during design, makes PPP projects completed quickly	3.02	0.85	3
4	Time performance of PPP procured projects have effect on the whole lifecycle of the infrastructure	2.95	0.31	4
5	Considering the time to deliver a project, PPP delivers projects on schedule than other forms of procurement	2.93	0.83	5
6	Time overruns sometimes experienced in PPP projects are influenced by the public sector	2.92	0.68	6
7	Simultaneous design and construction stages in PPP shortens overall project duration	2.79	0.8	7
8	PPP should be used in complex and customized projects with high uncertainty and long duration coupled with severe time pressure	2.78	1.37	8

Cluster Mean	**2.95**	**0.72**

The cluster mean and standard deviation are 2.95 and 0.72 respectively; since the cluster mean is above 2.5, hence it is accepted.

Table 13: Reliability Statistics

Cronbach's Alpha	Cronbach's Alpha Based on Standardized Items	N of Items
0.913	0.934	8

Table 13 shows the cronbach's alpha computed to measure the internal consistency among ratings of respondents and thus the Cronbach alpha was very close to one, indicating the scales used were reliable and the respondents understood the questions being put forward to them.

Table 14 shows the extent of agreement of developing a framework for PPP for delivery of public housing schemes. As shown in these tables, respondents ranked Public and Private sector require a structured and programmatic approach such as a framework to promote the effective, efficient and sustainable delivery of the PPP programme and, Legal framework is required for successful PPP in public housing schemes as the two most important ways of developing a framework for PPP for delivery of public housing schemes.

Table 14: Developing a framework for PPP for delivery of housing schemes

ITEM NO	DEVELOPING A FRAMEWORK FOR PPP	MEAN (X)	STD	Rank
1	Public and Private sector require a structured and programmatic approach such as a framework to promote the effective, efficient and sustainable delivery of the PPP program	3.89	0.21	1
2	Legal framework is required for successful PPP in public housing schemes	3.85	0.23	2
3	Jurisdiction/Location of the PPP public housing scheme will determine how the framework will be developed	3.64	0.23	3
4	Institutional and regulatory framework is required for successful PPP in public housing schemes	3.6	0.24	4
5	Monitoring procedure in obtaining services will have an effect in the development of the PPP public housing framework	3.6	0.35	5
6	National and State PPP Policies and Guidelines will aid in providing a consistent framework to deliver public housing	3.55	0.25	6
7	Size of the PPP public housing scheme contract will determine how the framework will be developed	3.35	1.19	7
8	Sector that will benefit from the PPP public housing scheme will determine how the framework will be developed	3.04	1.19	8
9	PPPs are individually regulated by the contract that specifies the responsibilities of both parties	3	1.09	9
10	Conflict resolution procedure will have an effect in the development of the PPP housing scheme framework	2.99	0.97	10
11	The procurement procedure in selecting the private entity and contract type being entered into by both parties will determine the development of the framework	2.96	0.76	11
	Cluster Mean	**3.41**	**0.61**	

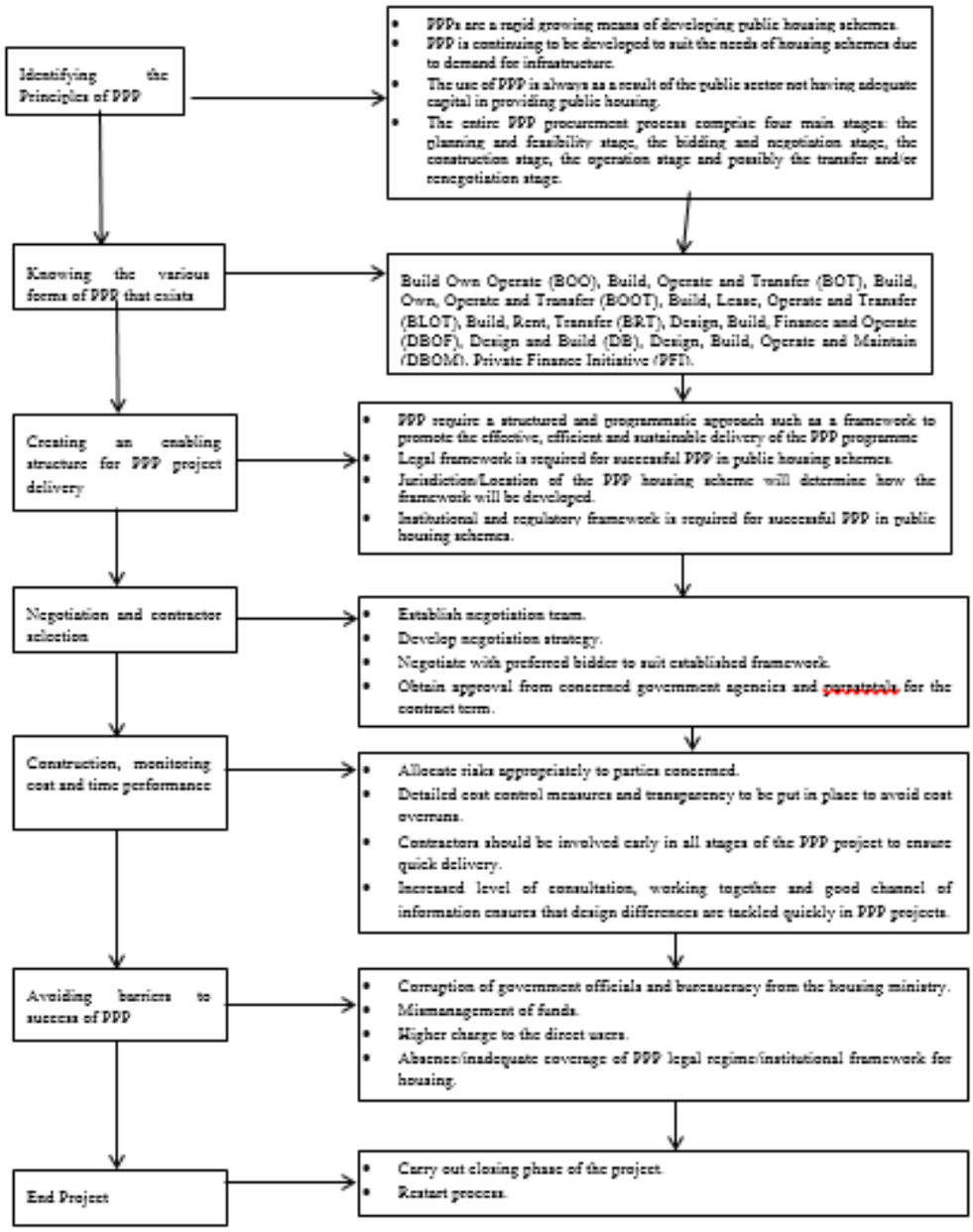
The cluster mean and standard deviation are 3.41 and 0.61 respectively; since the cluster mean is above 2.5, hence it is accepted.

Table 15: Reliability Statistics

Cronbach's Alpha	Cronbach's Alpha Based on Standardized Items	N of Items
0.941	0.956	11

Table 15 shows the cronbach's alpha computed to measure the internal consistency among ratings of respondents and thus the Cronbach alpha was very close to one, indicating the scales used were reliable and the respondents understood the questions being put forward to them. Based on the results gotten and discussed upon, a framework for the delivery of public housing schemes through PPP is thus formulated.

Figure 1: Framework for PPP for Delivery of Public Housing Schemes in North Central Nigeria



CONCLUSION

Based on the comprehensive research carried out on evaluating the performance of Public Private Partnership in the delivery of public housing schemes in North Central Nigeria, the following conclusions were brought up: Public Private Partnerships are a rapidly growing means of developing public housing schemes in North Central Nigeria; Cost and time overruns sometimes experienced in PPP public housing schemes are influenced by the private sector; Increased level of consultation, working together and good channel of information ensures that design differences are tackled quickly in PPP projects; Public and private sectors require a structured and programmatic approach such as a framework to promote the effective, efficient and sustainable delivery of the PPP program and also Legal framework is required for successful PPP in public housing schemes. The following recommendations hereby stem from the outcome of the study:

Sustainability: Government in Nigeria is popular for programme abandonment and discontinuity, especially when there is administration change. For effectiveness of PPP, North central Nigeria should endeavour to keep these programmes running beyond the administration that initiated them in as much as they remain relevant and meet needs. They should not be scarified on the altar of political negligence and lack of continuity which is the trade-mark of Nigerian politics.

Even spread of infrastructures: There is the need to open up the rural areas through infrastructural establishments. This will decongest urban centres in North Central of overcrowding and discourage rural-urban migration in the state.

Improving the already existing relative security (PPP laws) to attract more investors. This will bring about more employment generation, economic empowerment, reduction of social vices and political stability in the state.

Proper implementation of guides and frameworks: Several governments have passed into law various PPP laws and frameworks but little of these laws and acts have been implemented on government projects at various levels.

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STRATEGIC MANAGEMENT INITIATIVES IN SMALL AND MEDIUM SCALE CONSTRUCTION COMPANIES IN FCT ABUJA

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Small and medium scale construction companies' account for the bulk of Nigeria's construction industry and the impact of this sector on the growth of the national economy is seminal. The practise of strategic management in small and medium scale companies is low, however this does not imply that these firms lack intent or initiatives to grow and compete. It is on this grounds that this study seeks to examine the initiatives of small and medium construction companies and their performance in the Federal Capital Territory Abuja. The objectives are to examine the competitive strategies adopted by Small and Medium Construction Companies, to evaluate the dynamics involved in initiating and implementing strategic intentions and to determine its relationships with their performance. The study adopted a survey design approach using questionnaire to gathering data from 20 supply chain participants involved in 50 construction projects sites. The study data was analysed using descriptive statistics, mean item score and correlation test. Findings revealed that differentiation strategy is the most highly adopted competitive strategy by small and medium construction companies and the formation of strategic alliances improves the delivery of business objectives as a supply chain strategy. A competent the work force is essential for the success of any organisation and a significant correlation exist between the strategic management initiatives of small and medium and organizational performance. The study recommends the harmonisation of company efforts in small and medium scale organizations in line with strategic objectives for improved performance and growth of developing economies.

Keywords: Dynamics, Initiatives, Strategic Intent, Supply chain and Small & Medium companies.

INTRODUCTION

Nigeria is a low income country in spite of its huge amount of crude oil sales and exports (World Bank 2010; Jeffrey, 2005). Rewane (2016) reported that its current economic condition is not impressive with low growth rates in need of new innovative policies. Crosthwaite (2000) stated that the construction industry has the potential of stimulating positive economic growth, and strategic management can aid companies in construction to win more customers, develop relationships and have the competitive advantage (Foster *et al*, 2016). Small and medium scale construction companies' (SMCC) constitute the bulk of the construction industry and provides a major source of employment in Nigeria (Ofori, 2009). The practise of strategic managements in Nigerian construction companies has been an activity of low patronage in small and medium firms, however this does not imply that these firms lack the initiatives or capacity to compete and grow: on the contrast its adoption in large scale companies has been fully documented (Monday, Akinola, Ologbenla and Aladeraji, 2015). It is on this basis, that this study seeks to evaluate the initiatives of strategic management in small and medium scale construction companies FCT Abuja with a view to improve the strategic management practise. Premised on the above, the research seeks to answer the following questions; are there competitive strategies predominantly adopted by small and medium scale construction companies?

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What supply chain strategies principally deployed by small scale construction companies in project delivery? What are the dynamics involved in implementing strategic management initiatives? The Specific objectives of the study are; to evaluate the competitive strategies adopted of by small and medium scale construction companies, to examine the dynamics of strategic initiatives in organization and to determine the supply chain strategies deployed in project delivery.

Competitive Strategy

Three different strategies were identified by Foster *et al* (2016) as the basis for competition in construction industry namely: the cost strategy, the focus strategy and the differentiation strategy. The author went further to describe the cost strategy as a ‘‘generic strategy that focuses on reducing cost’’; a differentiation strategy as a ‘‘generic strategy that emphasizes on providing special value to customers in a way that it is difficult for competitors to replicate’’ and focus strategy as a ‘‘strategy that emphasizes on selecting its customers or market’’. Competition in the construction industry is no longer between one organization and another but rather by their supply chains (Tommelein, Ballard and Kaminsky 2009).

Supply Chain Strategy

Supply chains refers to ‘‘the structure put in place for suppliers, contractors, clients and representatives of the client to work together in harmony using information in order to fabricate components, transport materials, secure plants and equipment, install temporary works, engage labour and harness resources for construction’’ (Hatmoko and Scott, 2010). A supply chain strategy determines the procurement pattern of raw materials, transportation of these materials from companies to facilities and operations that construct the product for the clients (Kachiru 2009) and is described as a strategic decision which determines the structure and configuration of supply over the next several years.The failure of small and medium scale companies in implementing preset strategic goals could be attributed to a lack of strategic fit and has been attributed to the inconsistencies between the competitive strategy and the supply chain strategy (Iyagba & Ojuola 2004; Kachiru 2009).

Telsang (2007), described four supply chain strategies namely; strategic partnership, outsourcing, value density and buyer-supplier relationship. Charter, Kielkiewicz-Young, Young and Hughes (2001) also mentioned key management approaches to supply chain management which include outsourcing of procurement processes, collaborative planning and partnerships between customers and suppliers.

Strategic Alliances/Partnership

Telsang (2007) described strategic partnerships as a strategy that builds a close relationship between suppliers and buyers: this relationship is a formal alliance between two commercial enterprises usually formalized by one or more business contracts but falls short of forming a legal partnership or a corporate affiliate relationship. Yi Wei (2007) viewed strategic partnerships as strategic alliances that offers businesses the chance to join forces for a mutually beneficial opportunity and sustained competitive advantage. This alliance according to Isoraite (2009) is an agreement between two or more organizations to cooperate in a specific business activity so that each organization can benefit from the strengths of the other and gain competitive advantage. It involves the sharing of knowledge and expertise between partners as well as reduction of risk and cost in areas such as relationships with suppliers and development of new products and technologies.

Outsourcing

The concept of outsourcing came from the terminology “outside resourcing”, meaning to get resources from outside using external sources for business development, (Troacă and Bodislav, 2012). Outsourcing refers to a strategic decision to transfer one or more of an organization’s activities to a third-party specialist (Browne and Allen, 2001), and focus on its competencies. Competencies are mostly activities that the organization can perform more effectively than its competitors and which are of importance to customers. It is advisable that all non-core activities be outsourced to third party service providers. Core competencies are activities and skills in which the organization has long-term competitive advantage (Tompkins, Simonson, Tompkins & Upchurch, 2005). The phenomenon of outsourcing generally refers to procurement of materials and services inputs by a firm from a source outside. In this context, outsourcing can be both internal and international, (Troacă & Bodislav, 2012). (Wilcocks, Fitzgerald, 1993) identified various classification of

outsourcing, based on several criteria's: The proportion of outsourcing: total, selective, partial. Outsourcing can be applied in: human resources, project development management, and service management. The customers, some vendors - a client or several vendors - more customers. The period of outsourcing can be on long term or short term. Location of the supplier is local, international (offshore) and regional (near shore) closer to the customer.

Just – In – Time

The practice of supplying goods only as at when they are required has been referred to as Just in Time. Van Weele, (2002) Opined that to decrease waste, the simple idea of Just in Time is that all materials and products must become available when they are needed. It is a demand driven inventory control philosophy which views production as a system in which all operations, including the delivery of materials needed for production, occur just at the time they are needed. With JIT, the stock levels for raw materials, work in progress and finished products and accordingly, the operating costs can be kept to a minimum.

Buyer – Supplier Relationship

Several terms have been used in the literature to label the arrangement between buyer and suppliers such as "transaction" (Williamson, 1981; Winch, 2001), "interaction" (Håkansson, 1982) and "relationship" (Harland, 1996). The type of buyer-supplier relationships ranges from arm's length transactional relationships where two parties engage in a transaction isolated in time, to collaborative relationships which span over extended periods reaching beyond the specific transaction, i.e. for more than one project (Anderson and Narus, 1991; Sako, 1992).Telsang (2007) described a buyer –supplier relationship as relationships where buyers are involved in the operations of their suppliers directly through operational audits and open costing procedures or indirectly through training of workers of suppliers. The buyer provides a benchmark regarding performance of suppliers with the best practices available. The buyer can therefore devote his effort to building better and stronger relationships with suppliers, (Behdani, 2013).

Dynamics in Implementing Strategic Management Initiatives

The adoption of a clear strategic perspective by an organizations is one of the factors affecting its performance (Muhammad *et al*, 2011). Strategic initiatives was defined in a Project Management Institute sponsored study (Economist Intelligence Unit 2013) is a set of actions undertaken to sustain the execution of a strategy or simply put strategic initiatives are the ways that organizations turn visions into results and are divided into three distinct elements namely; strategic intent, delivery of benefits to key stakeholders and the transformation of the organization.

*Core competencies: ''*Some strategic management researchers are advocating the importance of dynamic core competencies or the understanding of firms' market positions from a dynamic theoretical perspective'' (Masood, Farooqui, & Aziz, 2009).

*Policy Development: ''*There is broad agreement that a strategic approach to human resource management (HRM) involves designing and implementing a set of internally consistent policies and practices that ensure a firm's human capital contributes to the achievement of its business objectives'' (Baired and Meshoulam, 1988 (as cited in (Masood, Farooqui, & Aziz, 2009))

*Learning: ''*Tacit-to-tacit conversion (socialization) takes place when tacit knowledge within one individual is shared with another through training, whereas explicit-to-explicit conversion (combination) takes place when an individual combines discrete pieces of explicit knowledge into a new whole. Tacit-to-explicit conversion (externalization) takes place when an individual is able to articulate the foundations of his or her tacit knowledge, whereas explicit-to-tacit conversion (internalization) takes place when new explicit knowledge is shared throughout the firm and other members begin to use it to broaden, extend, and reframe their own tacit knowledge. Strategic planning, effective administration and communication together with effective knowledge management, can contribute to minimize risk, whilst also carefully incorporating the employee voice into the decision-making'' (Raiden, Dainty, & Neale, 2004).

*Finance: ''*Unlike other economic sectors such as the manufacturing industry where demand may be determined almost immediately, this is not usually the case in the construction industry, which enjoys two distinct advantages. Firstly, the long gestation in building projects means that contracts, which may be completed two to three years later. The gestation

in construction is primarily dependent upon the size and complexity of the building project. The larger and more complex the project, the longer its gestation. Nevertheless, the scenario assumes that the financial crisis has not affected the liquidity of the developer-owner that can still finance the project through to completion. Although the construction sector is vital to the achievement of national socio-economic development goals of providing employment, shelter and infrastructure, it can be a significant source of negative impacts on the physical environment'' (Hasan, 2006)

*Market & Competition: ''*A good market analysis will have an economy review, which is very helpful in understanding where your current market is and where it is going, an organization that institutes a strategic management perspective will be setting its own direction and path through the changing waters of the market ''(Chinowsky & Meghann, 2001). Competition becomes more cut-throat, firms go out of business and a gradual decline in performance sets in as the most talented and enterprising individuals and firms make a step change into a new kind of work. Various metrics have been considered in literature in measuring organizational performance namely: cost, quality, delivery, profitability and reliability (Schoenherr and Swink, 2012).

RESEARCH METHODOLOGY

The study adopted a descriptive survey research design to achieve the research aim. The survey was carried out using structured questionnaires with the requisite data collected. A pilot study was initially conducted to identify construction companies in FCT, and total of 25 participants in construction companies were selected out of which 20 responded. This comprises of Directors, Management staff, Company staff, Workman, Supervisors, Divisional heads, Casual staff and Contract staff**.** The Federal Capital Territory Abuja was chosen as the study area for the research due to the numerous ongoing building and civil engineering construction projects. A purposive sampling technique was used and the population were building and civil engineering projects in the FCT. The specific objectives of the study are; to examine the competitive and supply chain strategies adopted by small and medium scale construction companies; the adoption of various competitive and supply chain strategies was measured using a 5 point likert scale namely: 5 = Very Often, 4 = Often, 3 = Sometimes, 2 = Rarely,1 = Never and analysed with mean item score and ranked. The dynamics involved in implementing strategic initiatives by organization were also measured using a 5 point Likert scale namely: 5 = Very Significant, 4 = Significant, 3 = Moderately Significant, 2 = Less Significant, 1 = Not Significant also analysed with mean item score and ranked. The relationship between the levels of implementation and the organizational performance was examined using spearman rank correlation.

RESULTS AND DISCUSSION

The qualification and experience of respondents in the studied areas are presented in Table 1.0. Table 1.0 shows that 25% of the respondents were executive directors and company staff, 15% were casual staff and supervisors, while 10% were management staff and divisional heads. The characteristics of respondent's organizations in FCT are presented in Table 2.0

Table 1.0: Respondents Characteristics

Characteristics	Parameters	Value	%
Organizational Role	Management Staff	2	10
	Company Staff	5	25
	Casual Staff	3	15
	Supervisors	3	15
	Divisional Head	2	10
	Executive Director	5	25
Highest Qualification	M.Sc.	9	45
	B.Sc.	4	20
	HND	7	35
Core Competences	Design	2	10
	Construction	9	45
	Consultancy	3	15
	Specialized services	6	30
Experience in Industry	1 – 5	3	15
	6 – 10	12	60
	11 – 15	2	10
	16 – 20	1	5
	20 – Above	2	10
Experience in Organization	1 – 5	5	25
	6 – 10	11	55
	11 – 15	2	10
	16 – 20	1	5
	20 – Above	1	5
Source: Survey	*2017*	**20**	**100**

Table 2.0 shows that 45% of the Organizations have been established more than 12 years ago, while 10% were established both between 8-12 years ago and less than 2 years ago. 30% have organizational size above 200 workers, whereas 10% possess an organizational size with workers 50 – 199 .65% of the workers belong to the Top level management and 5% belong to the bottom level management.70% of the organizations have a functional organizational structure, while 10% have a matrix organizational structure. The results reveals that executive officers and company staff are the majority of respondents with at least 6 -10 years working experience, the results further reveal that small and medium scale construction companies constitute a bulk of the respondent's organization with more than 4 years' experience majorly involved in construction works . The results also reveals that middle level managers form the bulk of the respondents in organizations with mostly functional organizational structure.

Table 2.0: Organizational Characteristics

Characteristics	Parameters	Value	%
Period Since Established	< 2 Years	2	10
	2 – 4 Years	3	15
	4 – 8 Years	4	20
	8 – 12 Years	2	10
	Above 12 Years	9	45
Organizational Size	0 - 9	6	30
	10 – 49	5	25
	50 – 199	2	10
	Above 200	7	35
Hierarchy in Organization	Top Mgt.	6	30
	Middle Mgt.	13	65
	Bottom Mgt.	1	5
	External	-	-
Type of Organizational Structure	Functional	14	70
	Divisional	4	20
	Matrix	2	10
		20	**100**

Source: *Field survey, 2017*

Extent in the Adoption of Competitive and Supply Chain Strategy

The level of compliance of organizations with various competitive strategies in the F.C.T Abuja are presented in Table 3.0. Also the level of compliance of organizations with various supply chain strategies are presented in Table 3.0.

Table 1.0: Extent in the Adoption of competitive and supply chain strategies

Items	Never	Rarely	Sometimes	Often	Very Often	Sum	N	MIS	Rank
Competitive Strategy									
Cost Strategy	1	3	9	3	4	66	20	3.3	2nd
Differention Strategy	-	3	8	8	1	67	20	3.4	1st
Focus Strategy	-	4	12	2	2	62	20	3.1	3rd
Supply Chain Strategy									
Outsourcing to Several Contractors (a)	1	3	6	6	4	69	20	3.5	5th
Outsourcing to Single Contractor (b)	5	10	5	-	-	40	20	2.0	4th
Long term Relationship with Construction Firms(c)	-	2	10	2	6	72	20	3.6	1st
Long term Relationship with Several Suppliers (d)	1	3	9	5	2	64	20	3.2	9th
Long term Relationship to a Single Supplier (e)	2	3	7	5	3	64	20	3.2	9th
Formal Alliance with other Construction Firms (f)	-	2	9	6	3	70	20	3.5	3rd
Formal Alliance with Several Suppliers (g)	-	1	12	2	5	71	20	3.6	1st
Formal Alliance to a Single Supplier (h)	2	1	6	6	5	71	20	3.6	1st
Warehousing before Use (i)	-	6	7	2	5	66	20	3.3	7th
Purchase of Materials when the need arises(j)	-	4	7	7	2	67	20	3.4	6th
Actively engage Suppliers in Planning (k)	-	7	5	4	4	65	20	3.3	7th

Source: *Field survey, 2017*

Supply chain strategy:
** Outsourcing*: a and b*
**Buyer Supplier Relationship*: c, d and e.*
**Strategic Alliance/Partnership*: f, g and h*
**Just in Time *: i, j and k*

Table 3.0 shows that the differentiation strategy ranks first with an MIS value of 3.4 as the most adopted competitive strategy by organizations in the F.C.T Abuja to business and the functional strategy as the least most adopted strategy with an MIS value of 3.1 . This confirms that most small and medium scale construction companies adopt a unique market approach when competing in the construction market. The results further revealed that most construction companies adopted strategic alliances or partnerships as their supply chain strategy in project delivery as formal relationships with suppliers ranked 1st with an MIS

value of 3.6 and buyer supplier relationships were least as long term relationships ranked 9th with an MIS value of 3.2. This results also confirms that most small and medium companies form strategic alliances with partner companies or suppliers in order to be able to deliver their services.

Dynamics in implementing Strategic Management Initiatives

The dynamics that interplay in implementing strategic initiatives by construction companies in the F.C.T Abuja is presented below in Table 4.0.

Table 2.0 : Dynamics in Implementing Strategic Management Initiatives

S. M. I.	N.S	L.S	M.S	S	V.S	Sum	MIS	Decision
Organizational Policies	1	2	4	9	4	73	3.7	Significant
Policy Development	-	2	6	9	3	73	3.7	Significant
Devotion of Financial resources	-	1	6	8	5	77	3.9	Significant
Financial Capacity	-	3	6	6	5	73	3.7	Significant
Workers Motivation	2	4	3	9	2	65	3.3	Moderately Sig.
Organizational Structure	-	2	8	8	2	70	3.5	Significant
Governance Model	-	4	4	8	4	72	3.6	Significant
Organizational Changes	1	5	4	7	3	66	3.3	Moderately sig.
Competency in the Work force	-	1	1	6	12	89	4.5	Very sig.
Organizational Performance	**V.P**	**P**	**F**	**G**	**V.G**	**Sum**	**MIS**	**Decision**
Customer Satisfaction	1	6	5	6	3	67	3.4	Fair
Construction Delivery Speed	-	1	5	5	9	82	4.1	Good
Quality	-	2	6	2	9	75	3.8	Good
Profitability	-	-	2	8	10	88	4.4	Good
Strategic Fit	-	1	4	13	2	76	3.8	Good

N.S = Not Significant, L.S. = Less Significant, M.S. = Moderately Significant, S = Significant, V.S= Very Significant* *V.P = Very poor, P. = Poor, F. = Fair, G = Good, V.G= Very good*

The results from table 4.0 reveals that the competency of the work force in an organization is very significant in implementing the organization strategic initiatives ranking highest with a MIS value of 4.5, the skills and expertise of an organizational work force is central in implementing organizations strategic management initiatives, this also goes to say that the kind of employees recruited into the organizations workforce will affect their realization of their strategic plans. Followed by the devotion of financial resources as having significant influence of the pace at which strategic initiatives are implemented with an MIS value of 3.9. Motivation of the workforce and openness to change were observed to have moderate significance on the organizations ability to implement their strategic initiatives with the least MIS value of 3.3.

Correlation between Strategic Management Initiatives and Performance

The correlation between the levels of strategic management initiatives and performance of organizations is presented in Table 5.

Table 5: Correlation between Initiatives in Strategic Management & Performance

Variable Correlated	N	P-Value	Decision
Customer Satisfaction and			
Organizational Policies	20	0.89	Accept
Policy Development	20	0.89	Accept
Devotion of Financial resources	20	0.92	Accept
Financial Capacity	20	0.89	Accept
Workers Motivation	20	0.91	Accept
Suitability of Organizational Structure	20	0.90	Accept
Governance Model	20	0.88	Accept
Organizational Changes	20	0.93	Accept
Competency in the Work force	20	0.80	Accept
Customer Delivery speed and			
Organizational Policies	20	0.88	Accept
Policy Development	20	0.85	Accept
Devotion of Financial resources	20	0.88	Accept
Financial Capacity	20	0.87	Accept
Workers Motivation	20	0.92	Accept
Organizational Structure	20	0.85	Accept
Governance Model	20	0.87	Accept
Organizational Changes	20	0.94	Accept
Competency in the Work force	20	0.86	Accept
Quality and			
Organizational Policies	20	0.85	Accept
Policy Development	20	0.90	Accept
Devotion of Financial resources	20	0.85	Accept
Financial Capacity	20	0.90	Accept
Workers Motivation	20	0.92	Accept
Organizational Structure	20	0.90	Accept
Governance Model	20	0.89	Accept
Organizational Changes	20	0.91	Accept

Competency in the Work force	20	0.90	Accept
Profitability and			
Organizational Policies	20	0.83	Accept
Policy Development	20	0.86	Accept
Devotion of Financial resources	20	0.81	Accept
Financial Capacity	20	0.87	Accept
Workers Motivation	20	0.89	Accept
Organizational Structure	20	0.93	Accept
Governance Model	20	0.82	Accept
Organizational Changes	20	0.90	Accept
Competency in the Work force	20	0.88	Accept

The p-values for the correlation test between the levels in implementation of strategic management initiatives against the customer satisfaction revealed that organizational policies (0.89) ,policy development (0.89), Devotion of financial resources (0.92) , financial capacity (0.89) , workers motivation (0.91) ,suitability of organizational structure (0.90),Governance model (0.88) ,openness to organizational change (0.93), competence of the workforce(0.80) are greater than 0.05 :.The result implies that the level in implementation of strategic management initiatives is significantly correlated to customer satisfaction.

The p-values for the correlation test between the levels in implementation of strategic management initiatives against the construction delivery revealed that organizational policies (0.88) ,policy development (0.85), Devotion of financial resources (0.88) , financial capacity (0.87) , workers motivation (0.92) ,suitability of organizational structure (0.85),Governance model (0.87) ,openness to organizational change (0.94), competence of the workforce(0.86) are greater than 0.05 : the result implies that the level in implementation of strategic management initiatives is significantly correlated to construction delivery speed.

The p-values for the correlation test between the levels in implementation of strategic management initiatives against the quality revealed that organizational policies (0.85) ,policy development (0.90), Devotion of financial resources (0.85) , financial capacity (0.90) , workers motivation (0.92) ,suitability of organizational structure (0.90),Governance model (0.89) ,openness to organizational change (0.91), competence of the workforce(0.90) are greater than 0.05 : the result implies that the level in implementation of strategic management initiatives is significantly correlated to quality.

The p-values for the correlation test between the levels in implementation of strategic management initiatives against the profitability revealed that organizational policies (0.83) ,policy development (0.86), Devotion of financial resources (0.81) , financial capacity (0.87) , workers motivation (0.89) ,suitability of organizational structure (0.93),Governance model (0.82) ,openness to organizational change (0.895), competence of the workforce(0.88) are greater than 0.05 : the result implies that the level in implementation of strategic management initiatives is significantly correlated to profitability.

CONCLUSION

The study reveals that the differentiation strategy is the most adopted competitive strategy by small and medium scale construction companies in the Federal Capital Territory. The study further revealed that having a competent work force is key in the implementation of strategic goals of the organization. Strategic alliance was revealed to be the most predominant supply chain strategies deployed by small and medium scale companies in project delivery. The study further reveals that levels in implementing strategic management initiatives is significantly impacts on the performance of the organization. What about the study implication as well as the limitations?

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STAKEHOLDERS` PERCEPTION OF THE CAUSES AND EFFECTS OF VARIATION ORDERS IN PUBLIC CONSTRUCTION PROJECTS IN SOUTH-EASTERN REGION OF NIGERIA

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The construction process is a complex and risky endeavour associated with unexpected changes at any stage of the project which may lead to issuance of variation order. Variation orders are caused by numerous factors which have significant effects on project performance. The study examines causes and effects of variation orders in construction projects in South-Eastern Region of Nigeria based on the perception of stakeholders in order to improve project performance. Data were obtained through structured questionnaires administered to 138 clients, 93 consultants and 117 contractors and analysed using mean score method, and Kruskal Wallis tests. Findings revealed that the ten major significant causes of variation orders are change of scope of work, errors and omissions in design, change in specifications by client, client`s financial difficulties, inadequate project objectives, inadequate working drawings, change in design by consultant, impediment in prompt decision making process, change of schedule by client, and fast tracking construction. The major effects include increase in overall project duration, increase in project cost, disputes, schedule delays, and rework. The conclusion is that clients, consultants and contractors have similar perception concerning the causes and effects of variation orders on performance of construction projects. The study recommends that effective project planning activities should be carried out especially on those issues that have potential effects on cost, time and quality of projects before implementation.

Keywords: Construction Project, Nigeria, Project Performance, Stakeholders, Variation Order.

INTRODUCTION

Construction projects in Nigeria are affected by many problems and complex issues in performance with effects ranging from low quality work, schedule delay, litigation, disputes, project abandonment or ultimate project failure as well poor cost performance of construction project (Lo, Fung and Tung, 2006, Odediran and Windapo, 2014)). Projects executed in the industry are recognized as complex in nature due to large number of parties such as clients, consultants, contractors and other external contributors directly or indirectly involved in operations. Alsuliman, Bowles and Chen (2012) observed that the nature of the industry is complicated and uncertain due to the unique features and conditions of each of the project, with large number of interdependent and sequential tasks. Ijaola and Iyagba (2012) also pointed out that construction process is associated with changes due to its complex nature which consequently leads to a variation order. The nature of construction activities are also quite uncertain and pre-disposed to various factors that could change, vary or alter the outcome from the initial plan. This change, variability or alteration otherwise referred to as variation order which has been confirmed from various studies indicate that it is one of the major factors contributing to poor performance of construction projects in the industry. Variation order generally affects project performance in terms of cost, time and quality.

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Adu & Opawole (2018). **STAKEHOLDERS` PERCEPTION OF THE CAUSES AND EFFECTS OF VARIATION ORDERS IN PUBLIC CONSTRUCTION PROJECTS IN SOUTH-EASTERN REGION OF NIGERIA.** Contemporary Issues and Sustainable Practices in the Built Environment. School of Environmental Technology Conference, SETIC, 2018

Researchers in the construction industry have used different terminologies to describe variation orders with such terms as "change", "variation", "change order" or "variation order". Change is defined as risk, state, process or methods that deviate from an agreed upon or original construction plan and specification (Lokhande and Ahmed, 2015; Jadhav and Bhirud, 2015; Lokhande and Ahmed, 2015). Jadhav and Bhirud (2015) described change as any activity on construction site which results in modification of original scope, executing time and cost of the project. On the other hand, variation is any type of deviation from an agreed upon well, defined scope or schedule of work (Osuman, Omran and Foo, 2009). Jadhav and Bhirud (2015) and Zawawi, Azman and Kamar (2010) however refer to change order as a formal document that is used to modify the agreed constraints and agreement which becomes part of the project document. This also agrees with the definition of variation order by various authors as deviation, variation or any change or modification by the owner or the owner's representative experienced in any project from base contract or work scope mutually agreed at contracting time (Kaene, Sertyesilisik and Ross, 2010; Alsuliman et al., 2012; Jadhav and Bhirud, 2015). Though the terms differ they connote the same meaning in practice and literature. The difference in the terminology is however insignificant in the in this study.

Studies in different parts of the world - Malaysia, Kuwait, South Africa, Ethiopia, Addis Ababa and even Nigeria indicate that variation orders are common and inevitable especially at production stage of construction projects (Memon, Rahman and Memon, 2014; Alaryan, Emadelbeltagi and Elshahat, 2014; Tadesse (2009); Ngwepe et al. 2015). They are however easier to manage at the initial phase than at other stages of construction because of possibility of reduction in rework. The effects of variation orders on the projects are generally worrisome and are not beneficial to the clients and contractors in most projects. Msallam, Abojaradeh, Jrew and Zaki (2015) stated that variation orders are destructive and unpleasant in a project because of the impacts on cost and completion date of project. Nonetheless, not all variation orders are detrimental they could also be beneficial. Beneficial variation orders are those that actually help to reduce cost, schedule or degree of difficulty in a construction project or even eliminate unnecessary costs (Arain and Low, 2005; Ngwepe, Aigbavboa and Thwala, 2015). Fisk and Reynolds (2015) pointed out that since change is inevitable in construction projects, managing the effect of change is therefore one of the greatest importance to the success of construction projects. The concerns of most researchers and practitioners are on the negative effects because of the impact on project performance.

Construction projects in the South-Eastern Region of Nigeria being a coastal area are exposed to various situations and factors which affect project performance. Projects are hardly completed without exceeding budgets and schedules dates. Problems such as alteration in design, construction programmes, changes in earlier assumptions and requirements are frequent in most projects. These problems are generally classified as `variation order`. This situation has not only affected project performance but has impacted on practices and expectations of the stakeholders. Consequent upon the detrimental nature of variation orders, there is a need to improve on the performance of construction projects. The focus of this study is to investigate archive of various contractors executing construction projects with the aim to generate reasonable amount of factors to represent the prevalent variation orders in the area. The current study postulates that variation orders are location base. Each location has its own distinct characteristics and difficulties. Adebiyi and Kasimu (2015) also pointed out that location of project has an enormous influence on project performance (of cost and time). Therefore, it will not be appropriate to generalize various sources and types of variation orders in different construction environment as same especially on project implemented in the South-Eastern Region of Nigeria. The objectives of the study are to investigate the causes and effects of variation orders in construction projects in the coastal area of Nigeria and determine their effects based on stakeholders perception. The null hypotheses formulated for the research are:

1. There is no significance difference in the perception of clients, consultants, and contractors of causes of variation order in construction project.
2. There is no significance difference in the perception of clients, consultants, and contractors of the effect of variation orders on project performance.

LITERATURE REVIEW

Variation orders and performance of construction performance

Variation orders affect performance of construction projects and its magnitude varies from one project to another. Koushki, Al-Rashid and Kartam (2003) studied on delays and cost increases in the construction of private residential projects in Kuwait. The result revealed that the projects that experienced variation orders incurred more than 58% time delay and cost increases when compared to those with no variation orders. The study of the Joint Legislative Audit and Review Commission (JLARC, 2001) on 300 road construction project in Virginia revealed that average project change was more than 11%. Homaid, Eldosouky and AlGhmdi, (2011) study on the change order in Saudi Linear construction projects revealed that the overall average increase in total cost of construction projects due to change orders was found to be 11.3%. A study of variation orders on construction projects showed that the average cost escalation was 7% of the original project cost with an average time extension of 30% more than the original project duration (Charoenngam, Coquinco and Hadikusumo, 2003). Awad (2001) carried out analysis and management of change orders for combined Sewer flow construction projects and found that variation orders was responsible for up to 7% of cost escalation of the original project cost. The results of the study on the types, causes, and frequency of construction claims in Dubai and Abu Dhabi in the UAE using a data from 124 claims for a variety of projects by Zaneldin (2006) indicated that the "variation order" claims were the most frequent type of claims with an important index of 60.5% and variation order was also the most frequent cause of claims with an important index of 55%. Leonard (1987) studied effects of change on labour productivity and found productivity loss of 10-20 per cent for every 4-5 fold increase in percentage of work hours expended related to change. The situations of other developing nations with respect to the situations of variation order are likely to be the same in those countries including Nigeria.

Key Causes of Variation Order

A construction business is subject to a lot of variability due to the unique nature of projects in the industry and stakeholders' involvement with other internal and external factors. The features of construction activities are also quite uncertain and pre-disposed to various factors that could change, vary or alter the outcome from the planned. These may result into variation orders among the major factors influencing the performance of projects. The provision of variation clauses in the conditions of contracts also suggest variability nature of building construction, as such, variation or change is inevitable in a project (Ssegawa, Mfolwe, Makuke and Kutua 2002; Finsen, 2005). Mohamed (2001) also pointed out that variation orders cannot be avoided completely. Researchers from different countries have made efforts to identify causes of variation orders in construction projects. Results of the findings show that variation orders in construction are caused by several factors. These include: 10 factors by Desai, Pitroda and Bhavasar (2015) in Centra Gujarat region; 23 factors by Ijaola and Iyagba (2012) in Nigeria, 18 factors by Memon, Rahman and Hasan (2014) in Malaysia, 21 factors by Lokhande and Ahmed (2015) in Yemen; 20 factors by Alaryan et al. (2014) in Kuwait; 36 factors by Yadeta (2016) in Addis Ababa. The study attempted to sort and refine some of the factors identified from literature and those suggested during pilot survey carried out in the study area. A total of 46 factors responsible for variation orders of construction projects in the study area were identified and adopted in this study as presented in Table 1. The factors were further categorized into four groups based on their sources as suggested by Harbans (2003); Arain and Low (2006); Sunday (2010); Alnuami, Ramzi, Mohammed and Ali (2010); Enshassi, Arain and Al-Raee (2010); Ngwepe et al. (2015).

Table 1: Key Causes of Variation Order in Construction Projects

Category of Factors	Causes of Variation Order	Authors
Client related factors	Change in design by client, change of plans or scope of work, inadequate project objectives, client`s financial difficulties, obstinate nature of client, change in material by client, change in specifications by client, impediment in prompt decision making process, replacement of contractor due to non performance	Lokhande and Ahmed, 2015; Gokulkarthi and Gowrishankar, 2015; CII, 1990; O'Brien,1998; Memo et al., 2014; Desai et al., 2015; Jadha and Bhirud, 2015.
Consultant related factors	Inadequate working drawings, change in design by consultant, errors and omissions in design, inadequate scope of work for contractor inadequate scope of work for contractor, consultant`s lack of historical data, design discrepancies, conflicts between contract documents, design complexity, design complexity, honest wrong belief of consultant, lack of consultant`s knowledge of available manpower and equipment, obstinate nature of consultant, technology changes, change in specifications by consultant, lack of coordination/communication, consultant's lack of judgment and experience, value engineering	Fisk, 1997; Arain et al. 2004; Lokhande and Ahmed, 2015; Desai et al., 2015; Jadha and Bhirud, 2015; Gokulkarthi and Gowrishankar, 2015.
Contractor related factors	Differing site conditions, lack of contractor`s involvement in design, change of schedule by contractor, contractor's lack of judgment and experience, unavailability of equipment, obstinate nature of contractor, obstinate nature of contractor, shortage of skill manpower, poor procurement process, contractor`s financial difficulties, contractor`s lack of historical data, unfamiliarity with local conditions, contractor`s desired profitability, lack of strategic planning, fast tracking construction, defective workmanship	Memo et al., 2014; Lokhande and Ahmed, 2015; Desai et al., 2015; Jadha and Bhirud, 2015; Jadha and Bhirud. 2015; Gokulkarthi and Gowrishankar, 2015.
Other related factors	Non conformance or new government regulations, weather condition, change in economic conditions, unforeseen problems, health and safety considerations,	Desai et al., 2015; Gokulkarthi and Gowrishankar, 2015.

Effects of variation order

According to Al-Hakim (2005) it is rare that projects perform precisely in line with their original schedule due to reasons such as, business condition changes, delivery slips, and corrections to design. This results to variability otherwise referred to as variation order. Variability in project implementation affects not only project performance in terms of time and cost but also adversely affect the quality, health, safety, and professional relations (Thomas et al., 2002; Arain and Pheng, 2005). The effects of variation order on construction projects as reported by some researchers include increase in project cost, additional payment for the contractor, increase in overhead expenses, completion schedule delay, rework and demolition, dispute between owner and contractor, disruption and change in work condition, low productivity (Alaryan et al. 2014; Arain and Low, 2005). These effects including other major ones studied by others are collated and classified under main factors as presented in Table 2.

Table 2: Major effects of Variation Orders

Factor	References
Decrease in productivity	Jadhav and Bhirud, 2015; Ibbs, 1997; Hanna and Gunduz, 2004.
Delay of completion schedule	Mohamed, 2001; Koushki, 2005; Gokulkarthi and Gowrishankar, 2015.
Dispute between owner and contractor	Jadhav and Bhirud, 2015; Charoenngam et al. 2003; Bower, 2000.
Decrease in quality of work	Gokulkarthi and Gowrishankar, 2015; Smallwood, 2000; Keane et al., 2010.
Increase in construction cost	Jadhav and Bhirud, 2015; Ibbs, 1997; Ssegawa et al. 2002; Arain and Pheng, 2005.
Additional money for contractor	Jadhav and Bhirud, 2015; Gokulkarthi and Gowrishankar, 2015.
Delay of material and tools	Gokulkarthi and Gowrishankar, 2015.
Work on hold	Gokulkarthi and Gowrishankar, 2015.

Increase in overhead expenses	Gokulkarthi and Gowrishankar, 2015; Osman, Omran and Foo, 2009.
Delay in payment	Gokulkarthi and Gowrishankar, 2015.
Demolition and re-work	Jadhav and Bhirud, 2015; Osman, Omran, and Foo, 2009.
Health and Safety issues	Arain and Pheng, 2005.

METHODOLOGY

The research adopted exploratory survey design approach involving the use of structured questionnaires. The survey consists of 223 clients, 152 consultants and 202 contractors involved in the construction of public projects in the study area established using the Taro Yamane formula (Udofia, 2011). A random sampling technique was used in the study. The valid questionnaires used consist of 138 clients, 93 consultants and 117 contractors. Forty six variation order factors were identified from literature and were later group into four categories: client related, consultant related, contractor related, and other related group. The respondents rated the variables on a five point Likert-scale from 1 (insignificant) to 5 (extremely significant). The effect of each factor on project performance was also measured on a five point Likert-scale from 1 (not effective) to 5 (extremely effective). Data collected were processed using Statistics Package for Social Sciences (SPSS) version 17, to obtain the Mean Score (MS).The difference among the perceptions of clients, consultants, and contractors of causes and effects of variation orders were analysed Kruskal Wallis tests.

RESULTS AND DISCUSSION

Evaluation of Causes of Variation Orders

There are several factors responsible for variation orders of construction projects. Based on the objectives of the study, 46 factors constituting causes of variation orders in the construction industry were identified through literature review and pilot survey conducted during the study. The factors were later categorized into four major groups to reflect the sources and originators of the factors. The groups are: client related, consultant related, contractor related, and other related group. The responses of the respondents on the factors were measured as described in the methods of the study. Data collected were scored, processed, and analysed using Mean score (MS). The results are presented in Table 3.

Table 3: Causes of Variation Orders in Construction Projects

S/n.	Factors	Client		Consultants		Contractors		Overall	
		MS	Rank	MS	Rank	MS	Rank	MS	Rank
	Client related factors								
1	Change of plans or scope of work	4.65	1	4.61	1	4.7	1	4.65	1
2	Change in specifications by client	4.61	2	4.56	3	4.56	6	4.58	3
3	Client`s financial difficulties	4.53	7	4.53	6	4.6	4	4.55	4
4	Inadequate project objectives	4.58	4	4.44	10	4.58	5	4.53	5
5	Impediment in prompt decision making process	4.49	10	4.56	3	4.39	18	4.48	8
6	Change of schedule by client	4.44	15	4.39	15	4.61	3	4.48	9
7	Change in design by client	4.33	20	4.19	26	4.54	7	4.36	19
8	Replacement of contractor due to non performance	3.88	34	4.28	20	4.05	29	4.07	27
9	Change in material	4.12	27	4.23	24	3.81	37	4.05	28
10	Obstinate nature of client	3.25	44	3.11	46	3.18	45	3.18	45
	Consultant related factors								
11	Errors and omissions in design	4.6	3	4.6	2	4.67	2	4.62	2
12	Inadequate working drawings	4.56	5	4.49	8	4.54	7	4.53	6
13	Change in design by consultant	4.49	9	4.53	5	4.51	9	4.51	7
14	Design complexity	4.51	8	4.39	13	4.47	11	4.46	12
15	Inadequate scope of work for contractor	4.26	22	4.44	11	4.44	14	4.38	16
16	Design discrepancies	4.46	12	4.33	18	4.35	21	4.38	16
17	Change in specifications by consultant	4.46	13	4.25	23	4.39	19	4.36	18

18	Conflicts between contract documents	4.19	24	4.28	20	4.19	26	4.22	23
19	Lack of coordination/communication	4.07	28	4.18	27	4.32	22	4.19	25
20	Consultant`s lack of historical data	4.33	19	4.16	28	3.82	35	4.11	26
21	Lack of consultant`s knowledge of available manpower and equipment	3.96	32	4.09	31	3.98	32	4.01	30
22	Consultant's lack of judgment and experience	4	29	3.6	40	4.04	31	3.88	34
23	Honest wrong belief of consultant	3.42	40	3.91	33	4.11	28	3.81	35
24	Value engineering	3.28	43	4.12	29	3.65	38	3.68	39
25	Obstinate nature of consultant	3.37	42	3.39	41	3.51	40	3.42	41
26	Technology changes	3.07	46	3.32	43	3.47	41	3.29	44
	Contractor related factors								
27	Fast tracking construction	4.47	11	4.49	7	4.44	13	4.47	10
28	Differing site conditions	4.54	6	4.37	16	4.47	10	4.46	11
29	Defective workmanship	4.44	14	4.46	9	4.42	15	4.44	13
30	Contractor`s financial difficulties	4.35	18	4.42	12	4.39	17	4.39	15
31	Lack of contractor`s involvement in design	4.21	23	4.3	19	4.46	12	4.32	21
32	Contractor's lack of judgment and experience	4.3	21	4.25	22	4.35	20	4.3	22
33	Change of schedule by contractor	4.18	25	4.11	30	4.3	24	4.19	24
34	Lack of strategic planning	4	30	3.95	32	4.18	27	4.04	29
35	Shortage of skill manpower	3.89	33	3.79	37	4.26	25	3.98	31
36	Contractor`s lack of historical data	4.12	26	3.86	35	3.88	34	3.95	33
37	Poor procurement process	3.77	36	3.63	38	3.81	36	3.74	37
38	Unavailability of equipment	3.65	38	3.82	36	3.6	39	3.69	38
39	Contractor`s desired profitability	3.65	37	4.19	25	3.16	46	3.67	40
40	Obstinate nature of contractor	3.47	39	3.37	42	3.19	44	3.35	42
41	Unfamiliarity with local conditions	3.39	41	3.25	44	3.32	42	3.32	43
	Other related factors								
42	Change in economic conditions	4.4	16	4.39	14	4.4	16	4.4	14
43	Unforeseen problems	4.37	17	4.33	17	4.32	22	4.34	20
44	Weather condition	3.98	31	3.89	34	4.04	30	3.97	32
45	Health and safety considerations	3.79	35	3.63	39	3.96	33	3.8	36
46	Non conformance or New government regulations	3.09	45	3.14	45	3.21	43	3.15	46

As presented in Table 3, change of plan or scope of work, errors and omissions in design, change in specifications by client, client`s financial difficulties and inadequate project objectives were the first five key important causes of variation orders in the construction projects based on the collective ranking of the respondents. The change of plan or scope of work was the most highly ranked among these factors responsible for variation orders by the three groups of respondents with mean scores of 4.65, 4.61 and 4.70 for clients, consultants and contractors respectively. This implies that this factor is a predominant cause of variation orders of construction projects in the study area. The importance of the factor can be attributed to inadequate planning at the project definition stage **(**Arain et al., 2004**).** This result agrees with the findings of the Construction Industry Institute (CII) (1990) which identified change of plan or scope of project as one of the most significant causes of variation in construction project.

Errors and omissions in design were ranked second in the overall ranking as well as the ranking orders of consultants and contractors with mean scores of 4.62, 4.60 and 4.67 respectively. However, the clients group rather considered the factor as third at the same time having the same MS with the consultants group of 4.60. it is established in literature and practice that projects with insufficient information at design stage or a situation whereby the designers are given inadequate time to translate client`s brief into designs, amounts to errors and mistakes which are often discovered late at the construction stage. This is in agreement with the observation of Enshassi et al. (2010) who notes that if errors in design were not immediately rectified during the design phase it would eventually appear in a construction phase and may degenerate into issuance of variation order to implement the corrective measures. The result of findings of Ssegawa et al. (2002) pointed out that clients and architects are the major cause of omission which is attributed to financial issues and

changes in designs. Results of the analysis presented in Table 3 also indicate that change in specifications by client was ranked third in the overall ranking which was also in agreement with the ranking order of contractors with mean score of 4.58 and 4.58 respectively. Clients and consultants groups however differ on the importance of the factor based on the result of the findings. The clients ranked the factor second with mean score of 4.61 while contractors ranked it sixth with mean score of 4.56. O`Brien (1998) observed that change in specifications is consequential action of inadequate project objectives which according to Memon et al. (2014) often leads to variation orders in the form of delay and increased overall cost in an attempt to make the changes.

The results in Table 3 show that client`s financial difficulties was ranked fourth based on the overall ranking of the respondents. The three groups of participants however differ in the ranking of the factor. While the ranking of the contractors was in agreement with the overall ranking with MS of 4.55 and 4.60 respectively, the clients ranked it seventh while consultants ranked it sixth with the same MS of 4.53. sound client`s financial status is very critical in achieving overall project success. Lack of accessibility and inadequate supply of funds impedes progress of construction projects and may eventually lead to stoppage of work. Studies show that financial difficulties lead to change in work schedules and specification, and compromise on the quality of the construction (Memon et al., 2014). O`Brien (1998) agrees with the findings of the study that owner`s financial problems can affect progress and quality of construction project. Inadequate project objective was agreed by the clients and contractors as one of the top five highly ranked factors that cause variation orders but the ranking was at variance with the consultants` ranking order of tenth with MS of 4.44. The results show that the clients ranked it fourth while the contractors ranked it fifth with the same MS of 4.58. Inadequate project objective could be the result of ineffective communication among the stakeholders which may lead to ambiguities in planning and execution. The impact of the factor on project performance can be very detrimental and could be responsible for rework, increase in project cost, change of schedule, among others.

Inadequate working drawing was ranked sixth in the overall ranking but the respondents did not agree on the ranking of the factor perhaps the priority they placed on it differs. The factor was ranked fifth by the clients, eighth by consultants and seventh by the contractors with the overall ranking of sixth position. These rankings show that the factor is among the top 10 factors, considered by the respondents that are responsible for variation orders in the study area. The significance of this factor lies in the fact that contractors programme of work is based on the scope of work as interpreted by the drawings which must be clear and concise (Geok, 2002), otherwise, the expectation of the stakeholders on project objectives may be jeopardized. Also ranked among the first 10 top factors responsible for variation orders is change in design by consultants with overall ranking of seventh. The clients and contractors were in agreement on the ranking of the factor as ninth with mean scores of 4.49 and 4.51 respectively. Incidentally, the factor was however ranked among the first five major factors by the consultants who rather placed fifth with MS of 4.43.

Impediment in prompt decision making is an organizational based responsibility of the client in every construction project. According to the results in Table 3, this factor was ranked eighth in the overall ranking with MS of 4.48. The consultants rather ranked the factor third as a reflection on the priority placed on the factor in the delivery of construction projects. The priority given to this factor by the contractors is however very low as implied in the ranking as eighteenth factor with MS of 4.39. The contractors` perception regarding this factor could be as a result of their non-involvement in decision making regarding projects especially at pre contract stage. The effect of this factor could only be felt by the contractor at construction stage when it takes a considerable length of time for the client organization to respond to a critical issue bothering on the project especially in traditional method of contract. Failure to make effective decisions at the right time may result in delay, temporary stoppage of work and the need for change order due to cost increments (Memon et al., 2014). The factor was however ranked tenth by the clients with MS of 4.49. Change of schedule by client was ranked ninth in the overall ranking but was however ranked fifteenth by the clients and consultants groups with MS of 4.48, 4.44 and 4.39 respectively. The importance placed on this factor by the contractors as a cause of variation orders is reflected in the ranking order of third position with MS of 4.61. Change of schedule by client can disrupt contractor`s work programme resulting in reallocation of project resources with additional cost implications. These could be the reasons that informed the contractors on the choice of the ranking position of this factor. The result of the study is also in agreement with Alajishi and Marzong (2008)

who reported that owners are the main originator of changes in projects. The last factor among the first 10 top factors that cause variation order is fast tracking construction with the overall MS of 4.47. The factor is however eleventh by the client group, seventh by the consultant group and thirteenth by the contractor group with MS of 4.47, 4.49 and 4.44 respectively.

Evaluation of the Effects of Variation Orders

Variation order affects performance of construction projects. It impacts on client`s value, disrupts workflow and strains the relationships among the owners, engineers, contractors, subcontractors, and others stakeholders involved in the construction process. In order to achieve the second objective of the study twelve variables constituting effects of variation order were identified from literature review. The perception of clients, consultants and contractors were sought on the effect of variation order on project performance. The effects were measured as earlier described in the method of the study. The results are presented in Table 4.

Table 4: Effects of Variation Order

Factors	Client		Consultant		Contractor		Overall	
	MS	Rank	MS	Rank	MS	Rank	MS	Rank
Increase in construction cost	4.79	1	4.86	1	4.91	1	4.85	1
Delay completion schedule	4.67	2	4.70	2	4.56	3	4.64	2
Demolition and re-work	4.42	3	4.49	3	4.77	2	4.56	3
Dispute among consultants	4.33	4	4.26	4	4.44	4	4.34	4
Work on hold	3.88	7	4.12	5	4.33	5	4.11	5
Decrease in productivity	4.16	5	3.98	6	3.40	9	3.84	6
Increase in overhead expenses	3.74	8	3.74	7	3.77	7	3.75	7
Delay of material and tools	4.09	6	3.56	8	3.05	10	3.57	8
Delay in payment	2.63	9.5	3.16	10	4.00	6	3.26	9
Decrease in quality of work	2.63	9.5	3.37	9	2.63	11	2.88	10
Additional money for contractor	2.05	11	2.42	11	3.56	8	2.67	11
Health and Safety issues	1.88	12	2.12	12	1.95	12	1.98	12

The results of Table 4 show that all the stakeholders individually ranked increase in construction cost as the most significant effect of variation order on cost performance of construction project with the MS of 4.79, 4.86 and 4.91 for the clients, consultants and contractors respectively. The ranking of this factor as the most important may be attributed to the fact that any alteration, omission or addition to design at production or implementation stage may result in demolition or rework of any cost sensitive component of the structure which invariably adds to the cost of the project (Clough and Sears, 1994). This is also similar to the findings of Memon et al. (2014) who identified increase in cost as the most common effect of variation order in Malaysian Public Works Department (PWD) known as Jabatan Kerja Raya Malaysia (JKR). The delayed completion schedule was ranked second by the overall ranking which was also in agreement with the ranking of the clients and consultants as second with MS of 4.64, 4.67 and 4.70 respectively. The factor was however ranked third by the contractor with MS of 4.56. The difference in the ranking suggests the practical disposition of the contractors as the first and direct professional to the actual work on site. This is also in line with the result of the study of Zawawi (2010) who observed that schedule delay is one of the major effects of variation order on project performance. The clients and consultants have also agreed on the ranking of demolition and re-work as third factor with MS of 4.42 and 4.49 respectively but were however ranked second by the contractors with MS of 4.77. The results in Table 4 also show that the three least ranking factors based on the overall ranking of the respondents include decrease in quality of work, additional money for contractor and health and safety issues as tenth, eleventh and twelfth factors with MS of 2.88, 2.67 and 1.98 respectively.

Comparison of agreement among the responding groups

The hypotheses of the study which were earlier stated to determine if there are significant differences in the perception of the respondents of the causes and effects of variation orders in the construction projects were both tested using Kruskal Wallis Test at $p \leq 0.05$. The decision rule is that if p-value > 0.05, the hypothesis is accepted, but if p-value ≤ 0.05, the hypothesis is rejected. The results of the tests are presented in Table 5.

Table 5: Result of Kruskal Wallis Test

Groups	N	Client Mean Rank	Consultant Mean Rank	Contractor Mean Rank	U-value	P-value	sig. level	Decision
Causes of Variation Orders	46	68.89	67.64	71.97	0.29	0.87	0.05	Accept
Effects of Variation Orders	12	17.75	18.33	19.42	0.15	0.93	0.05	Accept

The results of the Kruskal Wallis Test presented in Table 5 shows that p-values of $0.87 \geq 0.05$. This implies acceptance of the first hypothesis that there is no significant difference in the perception of clients, consultants, and contractors of the causes of variation orders in construction project. Table 5 also shows that p-values of $0.93 \geq 0.05$ which implies the acceptance of the second hypothesis that there is no significance difference in the perception of clients, consultants, and contractors of the effects of variation orders on project performance. The agreement in the perceptions of the respondents is an indication of the prevalence of variation orders in construction projects of the study area. The clients, consultants, and contractors involved in the procurement and delivery of construction projects in the south-eastern part of Nigeria should give priority to the factors and its effects as identified in this study especially during planning and implementation

CONCLUSION AND RECOMMENDATIONS

The complex nature and multi-dimensional approach of project delivery have posed a lot of challenges to effective performance of construction projects. Hardly can a project commence from inception to completion without experiencing change at a particular stage of the project. The study investigated the causes and effects of variation orders on construction projects in the South-Eastern Region of Nigeria. Forty six major causes of variation orders in construction projects were identified from literature and pilot survey of 10 key stakeholders involving in project delivery. These factors of variation orders were further categorized into four major groups. Based on the findings of the study, it was concluded that the five major causes of variation orders are change of plans or scope of work, errors and omissions in design, change in specifications by client, client`s financial difficulties, and impediment in prompt decision making process. The study also concluded that the five major effects of variation orders on construction projects include increase in construction cost, delay completion schedule, demolition and re-work, dispute among consultants, and work on hold. There is agreement among the stakeholders of the causes and effects of variation orders in construction projects executed in the South-Eastern Region of Nigeria. The fact remains that variation order is part of project but can be minimized if adequate measures are taken during planning and design stages. The design team should therefore focus on the key decisions that are fundamental to the realization of the set goals and be effectively communicated as a key to minimize variation order. The study also recommends that complete documentation of projects should be ready, verified and approved before award of contract.

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ASSESSMENT OF CONTRACTORS' PERCEPTION ON THE EFFECT OF CASH FLOW ON CONSTRUCTION PROJECT DELIVERY

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A positive cash flow is essential for the financial health and the survival of any business and contracting firms without exception. Cash flow is the actual movement of money in and out of a business. Several researches have shown that a lot of projects continue to suffer the problem of cash flow due to lack of prior knowledge on the effect of cash flow. This study aimed at assessing contractor's perception of the effect of cash flow on construction project delivery. The study was conducted through a well-structured questionnaire. A total set of 65 questionnaires were sent out to construction firms in FCT-Abuja Metropolis, and 52 responses were received and analysed using the descriptive analysis and relative important index to rank the factors, effects and the ways to reduce the effects of cash flow on the construction projects. The findings from the study indicated the main factors causing cash flow problems which were categorized under different groups: financial management (change in progress payment duration and financial position of the contractor) subcontractor (failure of subcontractor) supplier (change in price and delay in delivery)prior to construction (poor design and incorrect bid items) during construction (project delay, improper planning and management and mistakes in executing the work) communication (relations with the consultant) but deduction from the survey indicated that if pragmatic measures are not taken to reduce these factors that affect cash flow, it will leads to project abandonment, cash deficit, project delayed, and delay in making payment to the subcontractor rated high among the effects. The study recommended that Contractors should mitigate these problems which were rated very high i.e.: coordinating the payment cycle and chase of unpaid retention and claims.

Keywords: Cash flow, Contractor, Project delivery

INTRODUCTION

Financial management has long been known as a vital administration tool and cash flow management, which is essential to the survival of the construction organisation because cash flow is the most important corporate useful resource for its day-to-day routines activities and the needs to forecast cash flow is very important in order to improvise for the hard periods before it arrive (Harries and McCafffer, 2001). Finance has been claimed as the most important resource in the construction process, the construction industry suffers the largest rate of insolvency of any sector of the economy (Mawdesley et al., 1997; Odeyinka and Lowe, 2001). Odeyinka and yusuf (1997), seven out of ten projects suffer delays in their execution. In Nigeria, authors such as (Ajanlekoko, 1987; Odeyinka and Yusuf, 1997), have likened project abandonment to delays associated with payment and these delays, according to the authors, were caused by cash flow management problems. Companies tend to fail because of poor financial management, especially inadequate attention to cash flow forecasting (Bousssabine and Kaka, 1998; Calvert, 1986; Harris et at., 2006). Seeley (1984) defined cash flow as the actual movement of money in and out of a business. Harris and McCaffer (2001) defined cash flow as transfer of money into or out of a company. Effective cash flow management involves forecasting, planning, monitoring, and controlling of cash receipts and payments (Cui et al., 2010). According to MuttiHughes (2002), the degree of financial distress within the building industries is high, as compare to other sector.

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In construction process, sufficient management of cash as well as free circulation of fund give the construction a healthy existence simply because cash is the lifeblood of every construction (Harris and McCaffer, 2001). Cash flow in construction process can be involved with time associated with payment and statement regarding transaction as well as major balance cash discarded due to this transaction (Mawdesley et al., 1997; Odeyinka and Lowe, 2001). Abdulrazaq et al. (2012) stated that contractor cannot survive in the competitive construction industry without effective cash flow management and most contractors have failed due to poor cash flow management and in order to survive in this rapid change in environment, effective cash flow management is essential due to many unforeseen factors affecting cash flow to a contractor working on a project. Hence, whether cash flow effect is a major concern to contractors in the Nigeria construction sector or not is a question to answer. However, this study aimed at assessing the effects of cash flow on construction project delivery, thus these aim was achieved via: identifying the effects that contribute to cash flow problems, examining the extent of occurrence of the effects of cash flow on construction project, and strategies to mitigate the effect of cash flow on a construction project.

LITERATURE REVIEW

Seeley (1984) defined cash flow as the actual movement of money in and out of a business. Cash flow is the movement of cash during the construction process. Cash flow is one of the most important issues facing contractors today (Oukwube, 2005). It shows that early proportion of cash flow availability of funds by the contractor will reduce the rate of delay and enhance the completion of the project within the schedule period. From the inception to the final stages of the project, it is necessary that the management should be effective in term of how cash comes in and goes out of the project to ensure that the project stands a profitable one.

The success of any construction company depends largely on the ability of its management to foresee and prepare for the future (Abdulrazaq et al, 2012). Cash flow in construction contracts is concerned with the timing of payments and the consequent balance of cash remaining due to these transactions. The inability to properly plan for the movement of money during the construction may as well lead to the abandonment of project. Unlike Nigeria, authors have likened project abandonment to delays associated with payments. These delays, according to the authors were caused by cash flow management problems.

Kim and Grobler (2013) stated that due to contractual payment delays and retention of each inflow "many contractors working on a project will continue to experience an unbalance cash flow system until the very end of the project when cash held is received. Mismanagement of cash flow can result in times when cash available is critically low, which could disrupt the project or even result in bankruptcy for the contractor. The Surety Information Office concluded that the contractor's inability to forecast cash flow is the primary accounting issue that results in financial default.

Lip (2006), stated that the chain of payment in a Construction can be affected when there is a delay in making payment by one party to the contract which can affect the construction project. Apart from the delay in payment, poor cash flow can also result in delay in construction. According to Jiang et al. (2011), to ensure a delay free project delivery, effective cash management has to be put in place in order to achieve this effective management of cash, the need to look into the cash cycle of the construction is necessary because contactor need to be looking at the money coming in and how it is spent properly, because if it is not spent according to plan, it can affect the programme of the project.

According to Ahmed et al. (2003), who also said that the financial market's inability is one of the outside factors of lowly monetary situations such as money and increase rate, which will expressively give influence to project's cash flow and later affects the timely performance of the project, the underlying reasons of financial market uncertainty which will then lead to cash flow problems in construction project includes; increase in interest rate in repayment of loan, Rise of material prices, labour wages and transportation costs, and high rate of foreign exchange rate of imported materials and equipment.

According to Park et al. (2005), several factors affect cash flow to a contractor working on a project. These factors are; Duration of the project, Retention condition, Time for receiving

payment to subcontractor. According to Al-Isa and Zayyed (2007) some of the issues that affect the project cash flow could be seen on the Table1 below:

Table1: Categories of factors affecting cash flow

Category	Factors
The financial management	Changes in progress payment
	Having front payment
	Enormous retention percentage
	Late in releasing retention
	Financial position of the company
	Loan repayment
	Payment of material
	Over work measurement
	Under work measurement
	Changes in labour and staff wages
	Bank interest
Sub- contactor	Decisions to sub-contact
	Over/under measurement
	Disappointment of sub-contractor
	Hiring or ordering of equipment
Supplier	Delay to make payments to dealers
	Procurement problems
	Interruption in delivery
	Variation in price
Prior to construction	Poor design
	Inaccurate bid items
	Estimating strategies
	Cash flow forecasting
	competitors
Duration of construction	Errors in carrying out the work
	Improper adequate insurance
	Replacing of faculty work
	Big project's period
	Small project's duration
	Project delayed
	Shortage of material and equipment
	Absence of experienced labour
	Improper planning and controlling
Communication skills	Disputes between contractors
	Poor communication contractor
	Relations with owner
	Relations with consultant team
Others	Weather condition
	Positive change order

Source: Al-Isa and Zayyed (2007)

According to Cui et al. (2010) model has been developed for the system analysis of cash flow management strategies. These strategies include; front-end loading, back-end loading, overbilling, and under billing and trade credits. The study concluded that by using an overbilling and under billing strategy, a project management team could reduce project overdraft balance by as much as 11.4%. RICS (2012) stated that the most conceivably common use of a cash flow forecast for a cost manager and the contractor is to monitor the progress of the work on site against the program and agreed schedule.

Henry at al. (2003), the old method of cash flow prediction includes the breakdown of the bill of quantity in agreement with program of work to yield an assessed outflow profile. This could be foreseen and sensibly precise that the bill of quantities is correct and the agreement package fit in to the approach. Kenley (2001), acknowledged that other cash flow anticipating means to include the cost and value tactic and the unified scheme.

RESEARCH METHODOLOGY

The review of literature provided useful information on the factors affecting cash flow management, effects of cash flow problems on contractors and way of mitigating the issue to resolve cash deficit and project abandonment by contractors in relation to the issues of delayed and non-payment. The study comprises a reasonable fraction of contractor with nothing less than five (5) years working experience within the construction industry is considered in this research survey. The sample population is spread among large, medium and small contractors that has handled or is currently handling public building projects in Abuja. The survey employed the use of random sample technique and the sample size was computed using Kish's (1979) formula. The names and addresses of the contractor were abstracted from Corporate Affairs Commission (CAC) for easier location of the sample population.

A structured close-ended questionnaire was used in the field survey to generate data for the research. It contained items which are generated from the literature reviewed by the researcher. The generated data was analysed and presented in tabular. The data were analysed and conclusion and recommendation were drawn as a basis for the survey.

The questionnaire responses were based on Liket's 5-point scale and analysed using Relative Importance Index (RII), which helps in the ranking of the factors, effects and strategies in order of great importance. The formula is as follows:

Relative Importance Index:

$$RII = \frac{\sum(1n1 + 2n2 + \ldots\ldots n(nx)}{n(n1+n2+\ldots\ldots nx)}$$

n5 = number of respondent for the most contributory/strongly agree, highly adopted rated 5

n4 = number of respondent for more contributory/agree, adopted rated 4

n3 = number of respondent for contributory/neutral, averagely adopted rate 3

n2 = number of respondent for slightly contributory, disagree/low adopted rate 2

n1 = number of respondent for not ready 1

$\sum$ = summation.

Percentage

$$P = \frac{a}{} \times 100\ b$$

Where, a = required number of respondent

B = total number of respondent

P = percentage

RESULTS AND DISCUSSIONS

This part deals with the presentation and statistical analysis of data collected during the field survey. This exercise would help in arriving at finding, logical conclusion and making appropriate research recommendations

Table.2: Analysis of distributed questionnaire

Descriptions	Total number	Percentage %
Questionnaire sent out	65	100
Questionnaire returned	52	80

Source; Field study, 2015

From Table 2 above, Sixty-five (65) questionnaires were distributed as the sample size obtained through Kish's (1979) formula and fifty-two (52) were returned, this represents 80% response level.

Table.3: Factors that contributed to Financial management cash flow problems on construction project

Category	Factors	RII	Ranking
Financial management	Change in duration of progress payment	0.762	1st
	Change in progress payment conditions	0.554	6th
	Getting front payment	0.667	4th
	Delay in releasing retention	0.542	7th
	Financial position	0.692	2nd
	Loan repayment	0.563	5th
	Payments of material	0.673	3rd
	Change of labour and staff wages	0.667	4th

Source; field study 2015

The table 3 above, shows the view of the contractors on the factors that contribute to financial management category under cash flow problem. One of the factors that ranked high is change of progress payment duration with an index of 0.762; this can have a negative effect on contractor cash flow management if it's altered by the client, because the contractor is supposed to be paid based on progress made on the project. Financial position of the contractor ranked second among the factors under financial management category with an index of 0.692. If the financial position of the contractor is not all that strong, it can affect the project at hand.

Table.4: Factors that contributed to Sub-contractor cash flow problems on construction project

Category	Factors	RII	Ranking
Sub-contractor	Decisions to sub-contract	0.569	3rd
	Failure of sub-contractor	0.638	1st
	Renting or buying of equipment	0.586	2nd

Source; field study, 2015

From table 4 above, shows the view of the contractors on the factors that contribute to Sub-contractor category under cash flow problem, in this category, failure of sub-contractor was ranked high among the factors that contribute to cash flow problems with an index of 0.638, because if the subcontractors fail to carry out their obligations with regard to the contract, it will have a negative effect on the construction project

Table.5: Factors that contributed to Supplier cash flow problems on construction project

Category	Factors	RII	Ranking
Supplier	Delay in making payments	0.604	4th
	Procurement problems	0.635	3rd
	Delay in delivering	0.719	2nd
	Price changes	0.792	1st

Source; field study, 2015

The table 5 above, shows the view of the contractors on the factor that contribute to Supplier category under cash flow problem. Price change ranked first with an index of 0.792, this can affect the contractor's cash flow management and the project, because the intended price material may differ due to market condition. While delay in delivering was ranked with an index of 0.719, also has a negative impact on a project which can lead to delay in project delivery.

Table.6: Factors that contributed to Prior construction cash flow problems on construction project

Category	Factors	RII	Ranking
Prior construction	Poor design	0.796	1st
	Inaccurate bid items	0.754	2nd
	Estimating strategies	0.735	3rd
	Cash flow forecasting	0.632	4th
	Competitors	0.613	5th

Source; field study, 2015

The table 6 above, shows the view of the contractors on the factor that contribute to Prior construction category under cash flow problem. Poor design with an index of 0.796 and in-accurate bid items with the index of 0.754 can affect contractor's cash flow management, if it is not properly taking care of before embarking on the construction on site, it will affect the progress of the project.

Table.7: Factors that contributed to Duration of construction cash flow problems on construction project

Category	Factors	RII	Ranking
Duration of construction	Errors in carrying out the work	0.757	2nd
	Absence of sufficient insurance	0.663	4th
	Replacing of faculty work	0.623	6th
	Project's delayed	0.774	1st
	Shortages of material and equipment	0.757	2nd
	Inadequate skilled labourer	0.647	5th
	Incorrect planning and management	0.75	3rd

Source; field study, 2015

The table 7 above, shows the view of the contractors on the factor that contribute to Duration of construction category under cash flow problem. Project delayed was ranked highest with an index of 0.774; this can contribute to effect of cash flow management on contractors work on the project, because delay in project may affect the payment chain of the contractor and also the opportunity to compete for another project. Errors in carrying out the work and Shortages of material and equipment in executing the work were ranked second with an index of 0.757, and this can affect the contractor's cash flow forecast which will lead to both cost and time overrun.

Table.8: Factors that contributed to Communication cash flow problems on construction project

Category	Factors	RII	Ranking
Communication	Disputes between contractors and owner	0.577	2nd
	Poor communication – contractor staff	0.577	2nd
	Relations with owner	0.554	4th
	Relations with consultant team	0.631	1st

Source; field study, 2015

The table 8 above, shows the view of the contractors on the factor that contribute to the level of Communication under cash flow problem. Relationship with the consultant team was ranked highest with an index of 0.631. Contractor not having a cordial relationship with the consultant team can affect contactor's cash flow management, as proper management of work will not be ensured.

Table.9: The extent of occurrence of the effect of cash flow management on construction project

Effect	RII	Ranking
Abandonment of project	0.965	1st
Cash deficit	0.877	2nd
Delay of making payment to supplier	0.673	8th
Project delayed	0.725	3rd
Difficulty in loan repayment	0.618	6th
Financial position	0.695	5th
Affect cash flow forecasting	0.68	7th
Delay in making payment to subcontractor	0.719	4th
Cash overrun	0.634	9th
Time overrun	0.621	10th

Source; field study, 2015

From Table 9 above, numerous effects of cash flow on contractors were identified from the survey undertaken. Respondents were then asked to rate the effects of cash flow based on the list provided. The four (4) important effects identified were; abandonment of project, cash deficit, Project delayed, and delay in making payment to subcontractor.

Table.10: The Strategies to mitigate the effects of cash flow on construction project

Strategies	RII	Ranking
Coordinating payment cycle	0.873	1st
Create a cash aware culture	0.85	2nd
Understand your cash cycle	0.75	3rd
Spread risk	0.743	4th
Chase unpaid retention	0.656	5th
Front loading	0.457	6th
Utilizing company cash reserve	0.436	7th
Overbilling and under billing	0.416	8th

Source; field study, 2015

Since construction firms can work without profit but cannot be without cash, contractors suggested strategic methods to mitigate the effect of cash flow so as to stay in business.

From Table 10 above, shows that various strategies adopted by contractors to mitigate the effect of cash flow on construction project were identified from the literature. Therefore, respondents were asked to rate the strategies on the list provided. Among the five (5) strategies identified and ranked by the contractors, strategies with highest index were: coordinating payment cycle with 0.873, create cash aware culture with 0.850, understanding your cash cycle with 0.750, spread risk with 0.743 and chase unpaid retention with an index of 0.656.

CONCLUSION

The contractor indicated that cash flow has great effect on a construction project and the causes of such problems are: change of progress payment, change of price, delay in delivery, poor design, incorrect bid item, mistake in executing the work, project delayed, material and equipment shortage and improper planning and management. The analysis of the questionnaire also confirms that 67.3% of the contractor do not involve in cash flow forecasting which majority of them are the small contractor which means that without proper cash flow forecasting and management, contractor won't be able to last in aggressive construction industry. When cash flow problem arises, it causes some effect on a construction work which some of them had been identified in the survey. The gravest effects that are rated high is that, it leads to cash deficit, leads to project abandonment and also delay in project completion. Some of the respondents highly agreed to some of the suggested ways to minimize the effect of cash flow on contractor which is by coordinating the payment cycle, spreading of risk, create cash aware culture, understanding your cash cycle culture and chase unpaid retention.

RECOMMENDATION

The government should also take note on how contract are been awarded to contractor who are not financially buoyant since most public building projects deal with open tendering procedure which gives room for all contractors to bid for a project and the public building projects are mostly prone to issue of project abandonment due to financial stress, also the contractor should be advised to constantly monitor, check and review construction programme as this will enable him to detect any potential cash flow problems early while it is still possible to correct such problems.

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IMPACT OF PUBLIC PROCUREMENT REFORM ON CONSTRUCTION PROJECT DELIVERY IN KADUNA STATE

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This research examined the Impact of Public Procurement Reform on construction project delivery in Kaduna State with the objective of assessing the level of awareness of the Public Procurement reform in Kaduna State on the registered and unregistered construction professionals working in Government Ministries, Departments and Agencies, comprised of Quantity surveyors, Engineers, The study employed primary and secondary sources of data. A total of 130 research questionnaires were administered Builders, Architects and Estate surveyors in Kaduna, the study area. Out of these, 70 were properly filled and retrieved for analysis. The data collected included level of awareness of Public Procurement reform, rate of adoption of Public Procurement Reform, level of compliance with the provisions in the Public Procurement Act and public building projects executed from1999 to 2014 amongst others. The data obtained were analysed using Mean Item Score (MIS) and T-test. The result of the analysis showed that the level of awareness was high (50.3%), whilst the rate of adoption of the Public Procurement Reform was 50.7%. The study also found that there was a slight increase in the level of cost overrun at the pre and post PPA eras. However, there was no evidence of cost performance of buildings to differ significantly over the two time periods examined (1999 - 2007 and 2008 - 2014). The research consequently concluded that there was slight increase in the level of cost overrun between the pre and post PPA eras. Based on this, the research recommends that the Bureau of Public Procurement should focus on measures to improve the schedule certainty of construction projects carried out under the PPA, amongst others.

Keywords: Construction, Project, Delivery, Public Procurement Reform.

INTRODUCTION

The Nigeria construction industry contributes significantly to the environmental development and the natural economy (Enshassi *et al*., 2003). Its contribution to the latter is often referred to when considering the contributions of the various sectors of the economy to the Gross Domestic Products (GDP), Gross National Product and such like indices of economy measurement. Public procurement can simply be referred to as the process by which government acquires goods, works and services required in the course of governance (Anuku, 2011).

The procedure of award of construction contracts in the country is characterised with unethical and corrupt practices. However, the significance of this is noticed in the waste of public funds, abandoned projects and badly executed projects (Wahab, 2005). Public procurement has undoubtedly become an increasingly important issue in economic and business circles globally. This is clearly shown by the growing interest of donors, governments, civil society, professional organisations, the private sector and the general public on matters of public procurement (Odbiambo and Kamau, 2003).

Public procurement is an important role of government for a lot of reasons (Callender and Mathews, 2014). Public procurement has been utilised as an important tool for achieving economic, social and other objectives (Arrow smith, 1998; Thai, 2001).

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Federal and State Government Procurement Laws seek to ensure that public money is not wasted as a result of undue influence, favoritism or fraud. These rules restore the belief that all suitors for public and private works/contracts should be treated fairly yet on examination of public procurement system (BMPIU, 2005). A survey conducted in year 2000 revealed that before 1999, Nigeria was losing an average of N40billion annually through various kinds of manipulations of the procedure for award and execution of public contracts (Wahab, 2006). The launching of the ambitious national development plan (1970-74) and the expedient use of contract awards for execution of national projects in breeding social ills in the economy was discovered (Ekpo, 2004). These include the culture of excessive costs, corrupt management and ill-considered contracts. From being a middle income country in the 1970s Nigeria has fallen to be amongst the poorest nations in the world. It should be noted that in the 1960s and early 1970s, Nigeria, Malaysia, Indonesia, Taiwan, Singapore and South Korea had similar income per capital, GDP growth rates and under-developed political structure (Ekpo, 2004). Obasanjo (2003) also stated that "the Due Process Mechanism has saved Nigeria over N102 billion in two years arising from various Federal Government's over-bloated contracts".

Statement of Problem

In the late 1990s, the failure of the existing procurement system to cope with the expansion in government procurement requirements and to deliver value for money had become generally acceptable among government and donor partners. In order to reduce the challenges of the contract procurement method, public procurement reform was introduced (Wittig, 1999). Each country has its own external environmental issues and public procurement face different types of challenges, or the same types of challenges but at different levels from their counterparts in other countries (Thai, 2006). Since the introduction of the of Public Procurement Reform, a lot of research has been carried out and it was discovered that some shortcomings on issues, such as the existence of abandoned and poorly executed projects in the country have continued to raise questions on the impact of the procurement process in the construction industry since its establishment (Adewunmi, 2011).

It has also been observed that there is abuse of the procurement process, for example, contracts are being awarded to companies other than the best evaluated bidder, retrospective approvals for contracts, inconsistencies in tender evaluation and interference in the contract award process by unauthorized parties (Adewunmi, 2011).

Research evidence shows that since the introduction of the Public Procurement Reform in Nigeria in 2007, there is still in existence the problem of abandoned and poorly executed projects particularly in Kaduna State. For instance, projects are not completed on time, within budget and within the required quality and these problems are attributed to the problems of the current procurement system hence, the need to evaluate the Impact of Public Procurement Reform on construction project delivery in Kaduna State. In this regard, this study has responded to the following questions;

i. What is the level of awareness of Public Procurement Reform in Kaduna State?

ii. What is the rate of adoption of the Public Procurement Reform in Kaduna State?

iii. What is the level of compliance with the Provisions in the Public Procurement Act in Kaduna State?

iv. What are the impacts of the Public Procurement Reform on time and cost delivery in Kaduna State?

LITERATURE REVIEW

Public Procurement in Nigeria

Contractor selection in the Nigerian building construction industry is an essential part of the construction development process (Anyadike, 1999). Some of the criteria for contractor selection have been found to be unsuitable and at other times unrealistic or even misapplied for some selfish reasons on the part of the client and/or consultant (Omole, 2000). Ndah (2000) suggests that competitive tendering produces three things: the contractor, the contract price and the completion time for the project.

One method of improving construction performance suggested by Krammer and White-McCurry (2002) is to pre-qualify contractors prior to the bidding process, so as to ensure that contractors are able to execute the assigned project in accordance with client and project objectives. Apart from the failures of the industry in the areas of cost and time targets, quality of construction works generally have also continued to decline while some projects are being abandoned because of inability of the contractor to perform. The proliferation of the construction industry by different categories of contractors has no doubt created problems in selecting suitable and competent contractors by clients and construction professionals.

According to Familoye *et al* (2015) Nigeria joined the league of countries with procurement laws when the Public Procurement Act 2007 was signed to law on June 4, 2007 by the then President, Late Musa Yar' Adua. The purpose of the Act is to ensure transparency, competitiveness, value for money and professionalism in the public sector procurement system (Jacob, 2010). According to Lex Mundi (2012) the essence of the Act is to ensure that all the public procurements are conducted in a manner that is transparent, timely and equitable and based on the agreed guidelines, thresholds and standards. Krivish and Krekele (2013) state that the procurement law is to ensure openness of the procurement procedure, free competition of suppliers as well as equal and fair attitude thereto, effective use of state and local government funds and to reduce the risk of the commissioning party to the minimum. According to Fayomi (2013), Nigeria can be described as a country of irony as the socio-economic performance over the years remained superficial and unimpressive. This was largely attributed to high level of corruption or mismanagement of public resources closely linked up with the public sector procurement systems (Fayomi, 2013). The Act was therefore enacted to improve the procurement process and reduce the incidence of corruption in Nigeria.

Public Procurement Reforms in Nigeria: The Public Procurement Act, 2007

Contractors are one of the major players in the construction industry and the services they render are critical to the quality of the end product as well as meeting cost and time targets. In Nigeria, construction projects are mostly characterized by delays, substandard works, cost overruns, disputes, claims, and in extreme cases abandonment. These characteristics call to question the ability of the contractors involved in such cases, since it has been argued that the quality of a product to a large extent depends on the skills and experience as well as the competence of the producing agents. There has been almost universal criticism of failures of the construction industry to deliver projects in a timely manner as observed by Odeyinka and Yusuf (1997). This observation was corroborated by Ogunsemi (2002) that cost and time overruns have become common occurrences in the Nigerian construction industry and have continued unabated.

The prequalification criteria under the “Due process” in Nigeria according to BMPIU (2004) and Mshelbwala (2005) are categorized into two major groups. Basic/fundamental criteria are those with zero score yet the absence of any one of them automatically disqualifies a candidate contractor from participating in the prequalification exercise. Main criteria are usually rated with scores and all respondents with scores of 70% and above are referred to as the competent bidders.

Impact of Public Procurement Reforms on Project Delivery

Olajide *et al.*, (2015) view as unfortunate the fact that the Nigeria Public Procurement Act has not been able to achieve the primary objectives of transparency, accountability and value for money. Public Procurement Acts of most nations especially developing nations have not been able to achieve the purpose for which it was set to achieve. This is because of the challenges, among others, faced by the stakeholders in the implementation of the Acts due to the economic, social and political environment where the Act is operating. According to Jacob (2010), the greatest challenge for the enforcement of procurement law in Nigeria is the involvement of government functionaries in the procurement process and this is possible because government has not fully implemented the provisions of the Act. The Act is a threat to both the executive and the civil servants who argue that they must be involved in the procurement process in order to safeguard public resources (Jacob, 2010). According to Mahmood (2010), contract awards provide opportunity for procurement and there have been reported cases of extensive corruption, political influence and pressure from trade unions in the procurement process. Much as competition and transparency are necessary for any

efficient procurement process (Hunja, 2003), the stakeholders are not willing to relinquish their source of Illegal avenue to make money which the procurement law set to block or reduce.

Nigeria, like any other developing countries, faces the challenge of ensuring the successful operations of the Act. The continuous involvement of the Federal Executive Council in the award of public contracts violates the provisions of the Act. Jacob (2010) and Musanzikwa (2013) identify the involvement of government functionaries especially the executives in the procurement process as a challenge. According to Dza, *et al* (2013), the politicians lack the political will to commit fully to the reforms. The main function of government should be policy formulation rather than policy implementation (Musanzikwa, 2013).

Public procurement especially public contracts are an area of waste and corruption (Thai, 2005; Jones, 2007; Fayomi, 2013; Musanzikwa, 2013). The huge capital outlay in public procurement and the fact that public officials are poorly paid, corruption thrives among them especially in Nigeria. According to Jenny (2005), in some countries the alleged low level of income of civil servants may prompt them to engage more frequently the private sector employees in corrupt practices to achieve a level of earnings similar to the private sector. These poorly paid public officials are the executors of government policies who interact with private sector. This interface with the private concerns couple with urge by the private sector practitioners to secure the available scarce jobs breeds corruption. When contracts worth billions of Naira are won, these public officials still manage the construction process.

Shwarka and Anigbogu (2012) pointed out that Public Procurement Reforms are introduced to provide a strong base to improve service delivery and foster economic growth. However, the findings of this Study revealed that the procurement reform has not been efficacious in redressing cost and time overruns and other irregularities public building projects in Nigeria as there is no statistically significant difference from the situation that existed before the procurement reform. The implication of this finding is that if focus is not placed on improving procedures that improve performance outcome, the reform would end like other past government policies with limited success. The Study also shows a greater consensus agreement that inadequate project/budgeting plans by the client and the project team is the most constraining factors in the attainment of desired impact on public building projects delivery. This implies that the Ministries Departments and Agencies circumvent provisions of the Procurement Act which relate to proper project planning.

METHODOLOGY

The study employed primary and secondary sources of data. A total of 130 research questionnaires were administered Builders, Architects and Estate surveyors in Kaduna, the study area. Out of these, 70 were properly filled and retrieved for analysis. The data collected included level of awareness of Public Procurement reform, rate of adoption of Public Procurement Reform, level of compliance with the provisions in the Public Procurement Act and public building projects executed from1999 to 2014 amongst others. The data obtained were analysed using Mean Item Score (MIS) and T-test

RESULTS

Level of Awareness of Public Procurement Act amongst Construction Professionals

This section was concerned with answering the first research question of the study, which was to determine the level of awareness of Public Procurement Act (PPA) amongst professionals in the construction industry. Respondents were asked to indicate the extent to which they were aware of the PPA; the responses to the survey were analyzed and presented in terms of the proportion of respondents that were aware of the PPA as well as the level of awareness.

Table 1: Level of Awareness of Public Procurement Act

Degree of awareness	Mean score	%
Average level of awareness	3.41	34.8
Above average awareness	-	50.7
Below average awareness	-	14.5

The mean score for awareness that was computed was 3.41 on a scale of 5.0; this meant that sampled professionals possessed only an average level of awareness. However, further analysis of responses showed that respondents who claimed to have above-average awareness of the PPA comprised about 51% of the sample. It was worrisome that about 15% of sampled professionals professed below-average awareness of the PPA, since the PPA is one of the most important pieces of documentation in the construction industry.

Level of Adoption of Public Procurement Act by Construction Professionals

This section was concerned with answering the second research question of the study, which sought to determine the level of adoption of the Public Procurement Act (PPA) by professionals in the construction industry. Respondents were asked to indicate the extent to which they adopted the provisions of the PPA in their contractor selection activities; the responses to the survey were analyzed and presented in terms of the proportion of respondents that had adopted the PPA as well as the level of adoption.

The computed mean score for adoption of the PPA was 3.41 on a scale of 5.0; this value fell between 'indifferent' and 'always'. This meant that sampled professionals; adoption of the PPA was higher than 'sometimes', but below 'always'. This revealed that professionals did not always adopt the provisions of the PPA, even though 50.7% of the sample claimed to do so. It was however worrisome that 29% of sampled professionals professed to be indifferent to the adoption of the PPA.

These results were however in line with relevant literature on the subject matter that researched into the challenges faced by reform initiatives within the construction industry. Procurement reform is an especially prickly subject, touching as it does on the allocation of jobs within the construction industry.

Table 2: Level of Adoption of The Public Procurement Act

Degree of Adoption	Mean Score	%
Average level of adoption	3.41	
Indifferent to PPA adoption	-	29.0
Never adopted PPA	-	4.3
Sometimes adopt PPA	-	13.0
Always adopt PPA	-	50.7

Source: Computed by Author, (2017) from analysis of field survey data.

Level of Construction Professionals' Compliance with Public Procurement Act

This section was concerned with answering the third research question of the study, which was to determine the level of compliance with the specific provisions of Public Procurement Act (PPA) by professionals in the construction industry. Respondents were asked to indicate the extent to which they complied with named provisions of the PPA; the responses to the survey were analyzed and presented in terms of the mean level of compliance with the provisions of the PPA.

Ten compliance criteria were analyzed with the aid of the mean score technique. The extent to which professionals complied with each of the ten criteria was indicated by the mean score for the criteria, which was then used to rank all of the criteria. The highest ranked criteria, which indicated the criteria that was most complied with, was '*Advertisement which contains clear conditions for qualification of bidders in accordance with the Act.*' This had a mean score (MS) of 3.68 and a standard deviation (SD) of 0.88. The criteria that was least complied with was '*Existence and functioning procurement planning*' (MS = 3.46, SD = 0.92). It was observed that all of the ten criteria had mean scores within a narrow range of values (3.46 to 3.68). This meant nine of the criteria fell in the 'average to high' category, while the 10th was firmly average. These results were presented in Table 4.4.

Table 3: Level of Compliance with Specific Provisions of The Public Procurement Act

S/No	Compliance criteria	Mean Score	Std dev	Rank
1	Advertisement which contains clear conditions for qualification of bidders in accordance with the Act.	3.68	0.88	1
2	Implementation of procurement plans	3.67	0.82	2
3	Use of open competitive bidding	3.67	0.92	3
4	Transparency of bid evaluation process	3.65	0.92	4
5	Use of selective tendering	3.64	0.86	5
6	Level of public access to information	3.64	0.94	6
7	Existence and a functioning Tenders Board	3.58	0.86	7
8	Advert contain technical committee to Tenders Board	3.57	0.93	8
9	Appropriateness of procurement accordance with procurement plans	3.54	0.95	9
10	Existence and functioning procurement planning	3.46	0.92	10

Source: Computed by Author, (2017) from analysis of field survey data

Impact of the Public Procurement Act on the Delivery of Selected Types of Projects

This section was concerned with answering the fourth research question of the study, which was to determine the impact of the Public Procurement Act on the delivery of selected types of projects. This was done in two ways; first, mean values of percentage differences in cost and time performance of the projects in pre and post PPA era was tabulated. The cost and time performance of the projects was then analyzed using independent samples t-test in order to show if the two eras were significantly different. The results were presented in Tables 4.5 and 4.6.

Post-PPA time performance of the sampled projects was generally worse than that of the pre-PPA era. For example, institutional projects were completed at 7.8% more than the planned duration during the pre-PPA era. In the post-PPA era, the comparative value was 47% over planned schedules. Only commercial projects had an improvement in time performance in the post-PPA era as compared to the pre-PPA era (13.2% compared to 15.7% over budgeted time). However, commercial projects fared much worse when cost was considered; such projects were finished at 73.7% over cost budgets in post-PPA era, compared to cost overruns of 8.1% in pre-PPA era. A startling finding was for unclassified projects, where the cost overrun reduced from 8.9% in pre-PPA era to 0.4% in post-PPA era. Unclassified projects were those projects that could not be assigned to any of the three categories of commercial, institutional or residential, owing to relevant information not having been provided by the respondents.

Table 4: Variation in Cost and Time Performance of Different Types of Projects

Project types	% Difference in project time schedules		% Difference in project contract values	
	pre-PPA	post-PPA	pre-PPA	post-PPA
Commercial building projects	15.7	13.2	8.1	73.7
Institutional building projects	7.8	47.0	3.7	7.3
Residential building projects	5.6	16.9	5.5	7.1
Unclassified building projects	40.3	76.1	8.9	0.4

Source: Computed by Author, (2017) from analysis of field survey data.

In order to provide definitive statistical proof of significant differences or otherwise in project cost and time performance between the two time periods (pre and post PPA era), independent samples t-tests were carried out. The results showed that differences in time performance of institutional and residential building projects were significantly different between the two time periods. This was based on the value of the F-statistic which was larger than the critical value of $F_{0.05}$ at the computed degrees of freedom. The values however lay within the negative rejection zone of the t-distribution. This finding appeared to support the notion that most of the projects that were covered by the PPA, and to which the Act was strictly applied, were institutional and residential buildings that were developed for the public sector. Commercial projects were mostly not bound by the PPA, since the Act covered only projects funded with public funds.

Table 5: Independent Samples T-test Results for Difference between the Time Performance of the Selected Types of Projects

Project type	*x1*	*x2*	*Df*	*t*	$t_{0.05}$	*P*	Remark
Commercial	Pre-PPA time performance	Post-PPA time performance	81	0.646	1.671	0.520	Non-significant difference
Institutional	Pre-PPA time performance	Post-PPA time performance	39.310	-2.422	1.684	0.020	Significant difference
Residential	Pre-PPA time performance	Post-PPA time performance	47.803	-2.601	1.684	0.012	Significant difference
Unclassified	Pre-PPA time performance	Post-PPA time performance	61	-0.307	1.671	0.760	Non-significant difference

Source: Computed by Author, (2017) from analysis of field survey data.

The situation was different for the cost performance of building projects between the two time periods (pre and post PPA era).None of the categories of projects were significantly different in the two time eras. All of the values of the F-statistic were smaller than the critical value of $F_{0.05}$ at the computed degrees of freedom. It was thus accepted that cost performance of buildings did not differ significantly between the pre and post PPA eras. In terms of cost, the finding in this study revealed two things; one, there was a slight increase in the level of cost overrun between the pre and post PPA eras. Two, the increase thus observed was not large or consistent enough to be statistically significant. Projects carried out under the PPA do not appear to have fared batter in terms of cost than the projects that were carried out before the PPA came into effect.

Table 6: Independent Samples T-test Results for Difference between the Cost Performances of the Selected Types of Projects

Project type	*x1*	*x2*	*Df*	*t*	$t_{0.05}$	*P*	Remark
Commercial	Pre-PPA cost performance	Post-PPA cost performance	81	-0.659	1.671	0.512	Non-significant difference
Institutional	Pre-PPA cost performance	Post-PPA cost performance	37.159	-1.349	1.684	0.186	Non-significant difference
Residential	Pre-PPA cost performance	Post-PPA cost performance	75	0.177	1.671	0.860	Non-significant difference
Unclassified	Pre-PPA cost performance	Post-PPA cost performance	61	-0.014	1.671	0.989	Non-significant difference

Source: Computed by Author, (2017) from analysis of field survey data.

CONCLUSION

The average level of awareness of the Public Procurement Act (PPA) amongst professionals in the construction industry was not very high. 50.7% of the respondents have above-average awareness of the PPA, while 14.5% of sampled professionals professed below-average awareness of the PPA.

Statistical evidence has been provided that post-PPA time performance of the sampled projects was generally worse than that of the pre-PPA era, in the case of institutional and residential projects. However, although there was a slight increase in the level of cost overrun between the pre and post PPA eras, no conclusive evidence was found that the cost performance of buildings differed significantly over this period of time (1999 – 2015).

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SUSTAINABLE PROPERTY TAXATION

ESTATE SURVEYORS' PERSPECTIVES ON RESIDENTIAL PROPERTY TENANCY DETERMINATION IN ILORIN METROPOLIS

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All over the world, rental housing offers a more affordable way for many people to gain access to residential accommodation. Demand for the properties in residential property market seems to be increasing in Ilorin metropolis in view of the growing population arising from the influx of more people from other parts of the country because of the peaceful nature of the city. It was observed that tenancy determination was on the increase as most landlords were desirous of obtaining maximum rents from their tenants by regular rent review among other factors, which had led to high tenant turnover. This study examined the trend of tenancy determination in residential property market of Ilorin metropolis with a view to providing a guidance to the property managers and investors, and providing the basis for property management decisions. Total enumeration survey (100%) was adopted by administering questionnaire on the 22 practicing estate surveying firms in the study area. Information gathered was analysed using both frequency tabulation and trend analysis. The result of analysis showed that there was increasing trend of tenancy determination from 151 terminations in 2007 to 481 in 2016. This paper concluded that tenancy determination affected all categories of residential property although the low income rental properties were more vulnerable. This may discourage specific investors/landlords. It therefore called for a pragmatic management style and policy to stem down the increasing trend of tenancy determination.

Keywords: property managers, residential property, tenancy, tenancy breakdown and tenancy determination.

INTRODUCTION

Increase in Nigeria's population especially in the urban areas has led to astronomical increase in the demand for affordable housing whilst the supply side remains for the most part unresponsive and unable to meet growing demand (Imam, 2012). The ever increasing migration of people into the major cities in pursuit of greener pastures has made the quest for securing decent accommodation in the cities a herculean task, which only very few privileged individuals can afford. (Moneke, 2009). A very important aspect of the activities involved in property management is dealing with leases and most importantly, dealing with tenants to facilitate a good landlord-tenant-manager relationship (Kyle and Kennehan, 1979). In the tenancy contract, the landlord hands over exclusive possession of the property to the tenant for an agreed period of time, in return for rental payment and other conditions; at the expiration of the tenancy period, exclusive possession of the property reverts to the landlord (Action congress of Nigeria (ACN), 2011; Nigeria Property Centre, 2012). Property management problems would reduce considerably if all tenants would comply with the rules, covenants and conditions of a tenancy. Even where this is possible, some other reasons would make it imperative to terminate some tenancies.

In property management, lease administration and of course, tenancy determination is inevitable although several precautions may be taken to avoid involuntary moves. It is a global phenomenon, occurring in all parts of the world, both developing and developed countries (Centre for Housing Rents and Eviction (COHRE), 2004).

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Tenancy determination describes the practice of voluntary or involuntary removal of persons from their rented homes. It is frequently associated with a range of related terms such as premises recovery, tenancy breakdown, tenancy non-sustainment, tenancy failure, repossession action, eviction, ejection, forced removal, relocation, dislocation and displacement. As the causes can vary in most instances, different methods of determination have also been used in different places (Ibrahim, 2014). The main object is to remove the occupier with a view to recovering possession of the premises by the landlord. A landlord who wants to terminate a tenancy in order to recover possession of his property from a tenant for whatever reason must observe reasonable care and lawful procedure to achieve his objective. Self-help is an extra-judicial remedy to enforce or protect a right, where the landlord employs self-help, it must be lawful or else he may be criminally liable for his actions (Knowsley Council, 2013).

The consequences of premises recovery are highly disturbing, particularly for self-help methods, and its local impacts can hardly be forgotten by the victim individuals, families and communities (Landlord and Tenant Board, 2012; NCH, 2012). The Tenancy Law of Lagos State (2011) defines the rights and obligations of both the landlord and the tenant as parties to a contract. Tenants have security of tenancy, that is, a tenant can remain in occupation of the property until he decides to leave and gives the landlord a proper notice that he intends to move out. The landlord and tenant may also agree to end the tenancy, or the landlord issues a notice to end the tenancy for a reason allowed by the Act, and the tenant agrees to move. If the tenant does not agree with the landlord's notice, the landlord applies to court and the court issues an eviction (Landlord and Tenant Board, 2012). The warranty of habitability overrides any agreement and is implied into all landlord-tenant contracts, oral and written. This obligation starts at the beginning of the rental contract, and since tenants continue to pay rents periodically, landlords are expected to maintain the property in a good condition during the term of the tenancy (Langston, 1951; Powel, 1969).

Both the landlord and tenant have some obligations to respect under the tenancy agreement. Whenever there is a conflict between the landlord and tenant arising from breach of lease terms, eviction may be inevitable especially when other forms of settlement are not feasible (Ojo, 2007). While tenancy determination raises a lengthy series of human, social, economic and political considerations, this study will examine the practice primarily within the purview of residential property management practice. Given the nature of this study, the specific objective of the research is to examine the trend of tenancy determination in property management practice. It is hoped that the study will be of considerable source of knowledge to students, professional property managers and the public in general as a handy reference material on tenancy determination. As the study shows the trend of tenancy determination in property management practice, it will be of considerable importance to policy makers, property investors, property professionals, landlords, tenants and the public at large.

The Study Area

Ilorin is located on Latitude $8^{0}30$'N and Longitude $4^{0}35$'E. It lies in the transitional zone of the middle belt and serves as a gateway city between the north and south-western part of the country. Ilorin has a tropical wet and dry climate, and a mean rainfall of about 1318mm, which begins in April and ends in November. The city is a Yoruba settlement as it was founded in the 17th century by an itinerant hunter called Ojo from Gambe near Oyo-Ile (Taiwo, 2005). At the time of Ojo's arrival, the place now known as Ilorin was mostly a virgin land inhabited by a hermit Baruba family at a place still called Baruba near "Idi-Ape". It was not the intention of Ojo as an itinerant hunter, to establish a settlement there. He only incidentally found near the hut the hermit Baruba was living, a well-positioned rock that was remarkably suitable for sharpening tools and decided to erect a transit camp at the site. The name Ilorin is, therefore, believed to be a contraction of "Ilo – Irin" meaning "Iron Sharpener".

Ilorin consists of many tribes like Yoruba (the largest and the most popular), Hausa, Fulani, Nupe, Kanuri, Mali, Kamberi, Baruba and Futa (Taiwo, 2005). The 2006 population census figure revealed that there were 2,371,089 people in Kwara State with growing rate of 6.2% (NPC, 1991 and 2006; Odeniyi, 2007). Out of this, 1,012,894 representing about 42% of the state total population lives in Ilorin. The state capital is experiencing a very high rate of population growth over the time. The metropolis is divided politically to form parts of five local government areas. One urban – Ilorin West Local Government, and four rural – Ilorin East, Ilorin South, Moro and Asa Local Government Authorities. Each of these LGAs cuts across some parts of Ilorin metropolis but has its headquarters outside Ilorin except Ilorin West Local Government Authority, which has its headquarters within the metropolis.

The earlier settlers in Ilorin engaged in primary activities like farming and hunting expedition and later Islamic education with arrival of Islamic scholars from Sokoto. This attracted a large concentration of people from different parts of the country. When the city became a state capital in

1967, the pace of commerce and public administration increased tremendously. Ministries, parastatals, statutory corporations and quasi government institutions were established. Light industries, commercial houses, professional offices and businesses sprang up and grew rapidly. In view of the administrative status, basic infrastructural facilities like electricity, roads, water supply, and services like telecommunication, health care were improved and extended to nooks and cranny of the township. These and other developments led to immigration of people who hope to benefit from the opportunities created by the magical transformation of the township into the one that provided solutions to the problems of unemployment and poverty. The city maintained its dominant position as the capital, commercial and administrative centre of the state. Today, most residents are engaged in public and civil service working in the federal and state ministries, local government secretariats, educational institutions like the federal and state universities, state polytechnic, secondary and primary schools, teaching hospital, federal research institutes, and other places. A lot of private professional offices and artisans are also present in Ilorin. The economic base is now very expansive and extensive, and thus provided ample employment opportunity for school leavers, graduates, skilled and unskilled persons. All economic activities associated with urban areas in Nigeria are common in Ilorin.

The Peculiarities of Residential Property Market of Ilorin Metropolis

The Ilorin property market can be classified into three viz: the residential, commercial and industrial property sub-markets. The residential property sub-market is characterised by various types of houses present all over the city. The traditional centre of the city (Oke – lele, Pakata, Adangba, Omoda, Ajikobi, Oloje, Gegele, Sanni-Okin, Eruda, Balogun Fulani, Alanamu, Ita – Adu, etc) comprises mainly old compound and tenement houses interspersed with block of flats and is of high-density category. Medium density housing estates are found at Oloje, Kulende, Adewole, Irewolede and the Mandate estates. They are characterised by two, three and four – bedroom bungalows, and extensions and modifications to create extra spaces to accommodate more people. Low-density areas are found in the GRA, Taiwo and parts of Adewole areas where the houses are mainly detached bungalows of two to five bedrooms, duplex and maisonettes. Although there are owner-occupied properties, the residential property markets is very active in Ilorin metropolis as evidenced by the number of quacks apart from professionals engaged in real estate business. The main categories of residential properties found in the management portfolio of the estate surveying firms under the study are tenement, block of flats, bungalow, semi-detached house and duplex.

Tenement: This refers to the houses, which provide a multi–family accommodation. Tenement buildings are those that have a common entrance to the house, a common passage or veranda to which a number of rooms are opened; communal kitchen, bathroom and toilet usually located outside the main building or at the rear. The main building consists of double rows of rooms separated by the passage. Each of the rooms measuring about 12ft by 10ft provides accommodation for a household and so it is usually associated with a high density residential area and are usually over-crowded with a family of four to six or more persons living in a room. Tenements in form of single room or room and parlour, are found almost everywhere and are more common in high population density areas. These properties are mostly occupied by the low income earners. Most surveyors dislike taking up management contract on this property type.

Block of flats: This is a building containing usually two, four or six flats with each flat providing accommodation for a household. Each unit provides almost a complete privacy with shared outdoor space, and common parts like entrance door, corridors and staircase. Sub-categories of flats are one, two, three and four bedroom flats. kitchen, toilet and bathroom facilities are provided within the building and the number of each depends on design and decision of the owner. Flats which are common everywhere in the metropolis are mostly occupied by the low to medium income earners.

Bungalow: This is a building, which provides a self-contained accommodation on one floor for a single family. Most of the buildings under this category have built-in garage, and few have boys' quarters attached to them. The commonest types are two, three and four bedroom bungalows. These properties are mostly occupied by medium to high income earners. **Detached house**: This is a type of building that provides accommodation on two floors for one household. The ground floors consist of a lounge, dinning, kitchen, toilet and sitting room, while upper floor contains the living rooms and bathrooms. It stands alone without sharing any facility with another building. They are found in low density areas and are mostly occupied by high income class. **Semi-Detached house:** Two or more detached houses sharing some facilities such as fences, stair case, court yard, back yard, etc. **Duplex**: This is a type of building that provides accommodation on two floors like detached houses. However, there are two units sharing some facilities provided for the properties. Duplexes are found in low density areas and mostly occupied by high income class.

LITERATURE REVIEW

Meaning of Property Management

The definition of property management depends on the perspective from which the concept is viewed. **Narains Corp. (2007)**defined property management as" the range of functions concerned with looking after buildings, including collection of rents, payment of outgoings, maintenance including repair, provision of services, insurance and supervision of staff employed for services, together with negotiations with tenants or prospective tenants". A more refined definition given by Nwuba (1994) is the proper upkeep of land and building, the provision and maintenance of capital works, full and proper use of estate resources to preserve, conserve, exploit and restore them for the good of the estate and of all those who may derive profit, pleasure, enjoyment from them. It is the application of skills in caring for the property, its surroundings and amenities, and in developing a sound relationship between landlord and tenant.

Property management is a wide subject and may not be adequately explained by mere application of a definition. As a discipline, it concerns itself mainly with decisions on planning, control and use of land with the primary aim of securing optimum returns. It is the process of managing property that is available for lease by maintaining and handling all the day-to-day activities that are centred around the piece of real estate (Businessdictionary, 2012). Property management may involve selection of tenants to occupy a vacant space, collecting monthly rental payments, maintaining the property, and upkeep of the grounds. The management of real properties requires a written management agreement between the property owner and the manager. The management agreement is a comprehensive and detailed document outlining the responsibilities of both the owner and the property manager (Copperas and Harker, 2006).

Meaning of Tenancy

The rental arrangement between a landlord and tenant is called a tenancy **(**Landlord and Tenant Board, (2012). Friedman *et.al*. (1997) defined tenancy as "the right of possession of real property" and tenant as "one who is given possession of real estate for a fixed period or at will". Ordinarily, tenant is used to refer to someone who lives in a house, room, etc. and pays rent to the person who owns it. **Tenancy** is the right to occupy real property permanently, for a time which may terminate upon a certain event, for a specific term, for a series of periods until cancelled (such as month-to-month), or at will (which may be terminated at any time). The occupant, known as the tenant, must acquire control and possession of the property for the duration of the lawful occupancy. A tenancy can be created by any words that indicate the owner's intent to convey a property interest on another individual.

The tenancy sets forth the terms of possession, such as rent, length of time of possession and rules governing tenancy. The tenancy terms can be negotiated, but once it is signed, there is no grace period to back out of the agreement (Boulder, 2012). The main types of tenancy are tenancy for fixed term or term certain, periodic tenancy, tenancy at will, tenancy at sufferance, tenancy by estoppel, and statutory tenancy. (Card, Murdoch & Murdoch, 1998; The University of British Columbia, 2004; Alabi, 2005).

Reasons for Determination of Tenancy

In the tenancy contract, the landlord hands over exclusive possession of the property to the tenant for an agreed period of time, in return for rental payment; at the expiration of the tenancy period, exclusive possession of the property reverts to the landlord. However it must be noted that inasmuch the property reverts to the landlord, there is still a laid down procedure for recovering his property from the tenant. Generally, the reasons for determination of tenancies include expiration of period granted, breach of any covenants of the agreement, rent default, frustration, forfeiture and disclaimer. Termination may be due to the fact that the premises is being used for immoral or illegal purposes, the premises has been abandoned, the premises is unsafe and dangerous or that the conduct of the tenant or a person living with him constitutes intolerable nuisance. The landlord can also recover possession on the grounds that the premises is required for his personal use or that the premises requires substantial repairs. (Chianu, 1994; Aluko, 1998; Pawson, 2007; Crisis, 2012; Topham, 2012).

1. Effluxion or expiration of term granted

A lease or tenancy for a fixed period automatically comes to an end when the fixed period expires, and no formal steps are needed to put it to an end. Where the landlord intends to proceed to Court to recover possession, then he shall issue a seven-day notice. However where the agreement stipulates that a notice shall be given then it must be issued *provided* that it is not less than the statutory prescribed time. Even where the parties decide to extend or enter into a new lease, the initial lease comes to an end (Land Registry for England and Wales, 2012, Nigeria Property Centre, 2012and Aluko, 1998).

2. Breach of tenancy agreement

A tenant may break the tenancy agreement by doing something that contravenes the provision of the tenancy. For example keeping a cat or dog on the premises when this is not allowed; conversion, modification or sub-letting properties or part thereof to others without landlord's consent; not keeping the property reasonably clean; maintaining a large number of occupants or visitors, causing damage to the property; changing the locks without approval; causing a nuisance to neighbours; failing to water or maintain the garden and lawns; or using the premises for an illegal purpose or for business purposes without approval (Government of Western Australia, 2012; Mitchell, 2003).

3. Rent Default

The agreement must stipulate the amount of rent, when to pay, where to pay, manner and mode of payment. Refusal to follow the stipulations of the agreement with respect to rent payment may amount to default. Refusal to pay the right amount of rent as and when due is usually regarded as a serious breach of tenancy. Rent default alone accounts for a greater proportion of tenancy failure in many parts of the world (Mitchell, 2003; LandlordZone, 2008; Lagos State Government, 2011;Government of Western Australia, 2012; NCH, 2012).

4. Frustration

This is usually provided for under the *force majeure* clause. The doctrine of frustration provides that, where after a contract has been entered into, and for some reasons, it subsequently becomes impossible for one party to perform their obligations, due to supervening events beyond his control, then the contract has been frustrated. It involves a situation where subsequent events after the parties had entered into agreement made the performance of the contract impossible or impracticable. For example where the subject property is destroyed (Land Registry for England and Wales, 2012, Aluko 1998). The consequence is that the parties are discharged from their obligations under the contract. The Supreme Court in ***Araka v Mornier Construction Co. (Nig) Limited*** has held that the doctrine of frustration may in certain circumstances apply to leases. In that case, the period of the lease coincided with the Nigerian Civil War, and the government ordered that all expatriates leave the area. At the end of the war, the Landlord claimed rent for the period, and the Tenant contended that the government order frustrated the tenancy. The Supreme Court held that the tenancy was frustrated by the war and the Landlord was not entitled to the rent claimed (Nigeria Property Centre, 2012).

5.Forfeiture

A lease containing a proviso for re-entry or 'forfeiture clause' may enable a landlord to re-enter the premises and forfeit the lease, if the tenant has not paid the rent or has breached some other covenant(s) in the lease (Land Registry for England and Wales, 2012). The landlord may forfeit the lease by taking court proceedings or by peaceable re-entry. An interested person may apply to the court for relief from forfeiture. The landlord may be entitled to forfeit the lease that is, terminate the tenancy. This could arise under forfeiture clause, breach of condition, denial of landlord's title and non-payment of rent (Card, Murdoch & Murdoch, 1998; Hinkel, 2000, Aluko, 1998, Topham, 2012).

6.**Determination by disclaimer**

When a person becomes bankrupt or a company becomes insolvent, either a trustee in bankruptcy or a liquidator may by giving the prescribed notice, disclaim certain onerous property, including leases. This has the effect of terminating the lease (Land Registry for England and Wales, 2012).

7.Determination by other reasons

If leased property is taken for public use by condemnation, any lease therein is terminated. The tenant is entitled to compensation for the value of the unexpired term of the lease, and the tenant claim is superior to that of the landlord. This occurs where the subject matter of

the lease is subsequently cut by any of the acquisition laws e.g. revocation under Land Use Act (Section 28). The foreclosure of a mortgage or other lien may terminate a tenancy. If the mortgage or other lien was prior in time to the lease, and the tenant had either actual notice or constructive notice of the lien, then foreclosure will terminate the lease.

Methods of Tenancy Determination

The methods by which tenancy can be terminated are appropriate notice to quit, surrender, merger of interests or eviction. These are discussed as follows:

1.Notice to Quit

Notice to quit is a statutory requirement for termination of all forms of periodic tenancies. A lease for a fixed period automatically determines on expiration of the period granted. Such a lease cannot be determined by notice unless it is otherwise agreed upon. Periodic tenancies (weekly, monthly, yearly) can be terminated by notice in the manner already determined by the parties (Aluko, 1998; Chianu, 1994; Mitchell, 2003 and Taribo, 2011). It must contain the description of the premises, its location, the commencement and expiration of the tenancy. The length of this notice and its content depends on the length of the tenancy in question (ACN, 2011; Lagos State Government, 2011; Nigeria Property Centre, 2012). The length of the notice should be as agreed upon by the parties expressly in written agreement. In absence of written agreement, the length shall be in accordance with the provisions of relevant laws. Section 13(1) Tenancy Law 2011 of Lagos State, which provides for the length of notice as follows: Tenant-at-will: one week; Monthly tenant: one month; Quarterly tenant: three months; Half yearly tenant: three months; Yearly tenant: six months. In the absence of an express provision in writing, the nature of tenancy is a matter of evidence, and in the absence of any direct evidence to the contrary, it shall be determined by reference to the time when rent is paid or demanded. A notice to quit may be issued either by the landlord or by his solicitor or agent, who must be authorized in writing.

2. Surrender

This is the abandonment of a leased property, or premature termination of a tenancy, unilaterally by a tenant or with the consent of the landlord. When a tenant surrenders the tenancy, he agrees to give up his legal rights as a tenant and return possession of the rental property to his landlord. This will effectively terminate the lease agreement and end the landlord-tenant relationship. However, for the surrender of lease to be effective, both the landlord and the tenant must agree to it (Landlord and Tenant Board, 2012; Landlord Property Investment, 2012; Propertydo, 2012).Once the tenancy is surrendered, both the landlord and the tenant will be released from any future obligations to each other. The lease agreement will end and the landlord-tenant relationship terminated from the point of the law. However the parties will still be responsible for their past obligations before the lease was surrendered. For example if the tenant owed rents or utility bills before giving up his tenancy, he will have to settle the bills.

3. Merger

This means amalgamation of two estates in the same land so as to make one estate (Boros, 1986).A tenancy may be determined as a result of operation of the doctrine of merger which is the opposite of surrender. Under surrender, the landlord acquires the lease whereas a merger occurs when the tenant continues to hold on the lease and then acquires the reversion. It happens when the landlord and the tenant become the same person, for example when the lease and the immediate landlord's reversion are both acquired by a third party, or when the tenant acquires his immediate landlord's reversion (Victorian Consolidated Acts, 1997; Wylie 1998, LandlordZone, 2008, The 1911 Classic Encyclopedia, 2012; Wragge & Co., 2011; LexisPSL, 2013). The old tenancy terminates while a new one commences. While "merger" can be applied to a number of real estate circumstances, it most commonly applies in lease/ownership situations. The general rule is that when the same party holds both a tenancy and ownership on the same property, even if only for an instant, the tenancy "merges into the deed," and the tenancy disappears (Benson and Lamb, 2011).

4. Eviction

Eviction means forcing somebody to pack out of the house they are living usually permanently and for a stated reason. It is "a legal proceeding by a lessor (landlord) to recover possession of property" (Friedman et al 1997). When a tenant fails to comply with the lease agreement, the landlord may seek eviction of the tenant to terminate his rights to use the property. Eviction can be actual eviction, constructive eviction, partial eviction and retaliatory (Friedman et al, 1997; RHOL, 2006). Actual eviction exists where one is removed from the property either by force or process of law. When it is by the process of law it is called legal eviction (Aaron, 2003). It requires that a proper notice is served requiring the tenant to vacate the apartment within a specified time interval, and court process is used to follow up when the tenant dishonours the notice. This is mostly associated with deadlock conflicts

between a landlord and his tenant thereby requiring eviction as the only option for resolution. Constructive eviction exists when, through the fault of the landlord, physical conditions of the property renders it unfit for the purpose for which it was leased. For example, a landlord may allow the physical condition of an apartment building to deteriorate to the point that the premises are no longer safe for occupancy. A tenant who has been constructively evicted has a number of legal recourses. He may be able to terminate the lease, order constructive eviction, and end liability for future rent payments (Burke and Snoe, 2008). Partial eviction exists where a tenant is deprived of a portion of the property for example, where a substantial modification is required on one side of the building, the landlord and the tenant may agree to a partial eviction from the property because of the disruption to be caused by the work. The tenant's rent will be reduced accordingly. Retaliatory eviction according to Aaron (2003) and RHOL (2006) occurs when a landlord attempts to evict a tenant in response to some (legal) action taken by the tenant. Eviction suit could be dismissed if the tenant could convince the court that it is retaliatory.

RESEARCH METHOD

Both primary and secondary data required for this study were collected from estate surveyors. These included the records of tenancy determination within the time frame of ten years (2007 – 2016) in Ilorin metropolis. Also used were relevant literature materials from journals, theses, textbooks, development plans and other published materials on property management theory and practice. It also included materials from the internet sources for theoretical and conceptual issues relating to tenancy determination.

Total enumeration of the 22 practising estate surveying firms were considered for the study. However, of the 22 questionnaire distributed, only 21 were retrieved and found useful for the study. Having regards to the comparative financial and time implications of the methods, self-administered questionnaires were adopted. The questionnaire for data collection was a combination of closed and open-ended questions. The open–ended questions permit the respondents to give detailed answers in cases where their experiences cannot be easily articulated into few options. The closed questions were structured with options from which the respondents were expected to select the appropriate options that matched their responses. The questionnaire were segmented into two sections. The first section requires information on demographic variables and background of the respondents. The second section requires answers to questions relating directly to tenancy determination practice. Data collected were analysed using frequency tabulation and trend analysis.

Table 1: Frequency distribution of tenancy determination (2007-2016)

Property/Year	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	Total
Tenement	46	82	101	96	89	87	93	110	60	162	926
Flat	89	71	51	43	62	90	102	172	241	286	1207
Bungalow	5	5	3	2	8	8	7	8	17	21	84
Duplex	8	5	3	0	0	0	1	3	5	8	33
Semi-Detached	3	3	2	0	0	0	0	2	4	4	18
Total	151	166	160	141	159	185	203	295	327	481	2,268

Source**:** Authors' fieldwork (2017).

DISCUSSION OF RESULTS

1. Incidence of tenancy determination

The findings relating to the incidence of tenancy determination between 2007 and 2016 are presented in this section. The records showed that the number of tenancies terminated was decreasing generally from 2007 to 2010 when it started to increase again up till 2016. Specifically, determination of tenancies in tenement and block of flats were very significant as they recorded 926 (40.83%) and 1,207 (53.22%) terminations respectively while the other property types i.e. bungalow, duplex and semi-detached buildings recorded 84 (3.70%), 33 (1.46%) and 18 (0.79%) terminations respectively.

The variation may be due to the fact that virtually all property managers that responded to the questionnaire were involved in management of block of flats while some excluded tenement buildings from their management portfolios because they were considered more onerous. Taking a

critical look at the property types, it was observed that tenement and block of flats were commonly occupied by low and medium income class of people, while bungalow, duplex and semi-detached buildings were commonly occupied by high income class. The level of vulnerability to tenancy breakdown increased from high through medium to low income class. That is, the low income tenants were more vulnerable to tenancy determination than the medium and high income tenants. Rent default for example has been found to cause up to 90% of tenancy breakdown in many parts of the world Nigeria inclusive. This has also been related to poverty and poor or low salaries earned by low income tenants. This is corroborated by the findings from the studies conducted by Pawson *et. al.* (2006), Shelter (2009); Ibrahim (2014), Prince and Freeman, (2014) and Ambrose *et. al.* (2015). In the study area, salaries are generally low and the city's business men and women depend largely on salary earners for patronage as Ilorin metropolis is a civil servant area.

Looking at the record of terminations per year, it was observed that the least number of 141 terminations was recorded in 2010 while the highest number of 481 terminations was recorded in 2016. This reflects the economic crises which translated to recession in 2015-2016 when many employees were owed salaries of up to 10 months or more in some situations. This resulted into rent defaults, repair and maintenance agreement breakdown, and other problems associated with tenant's vulnerability and poverty.

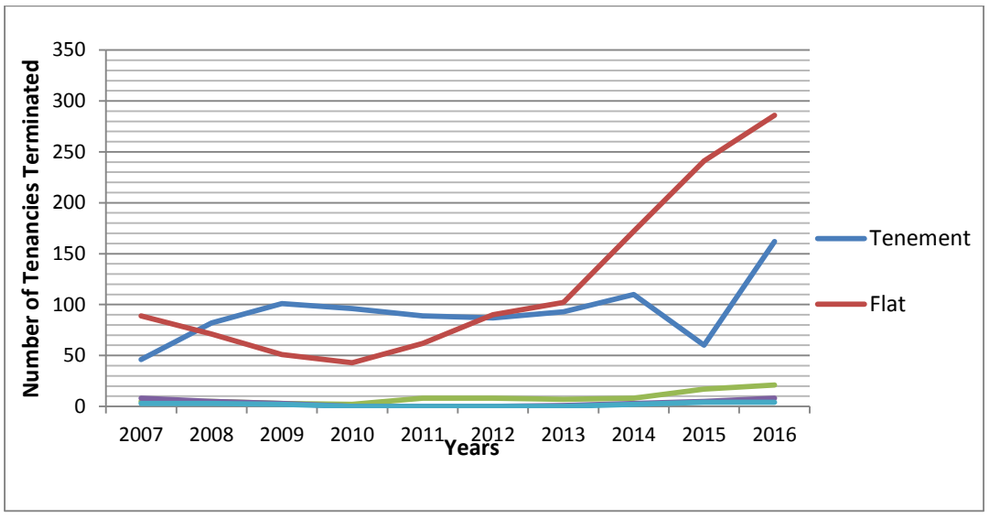

Fig. 1.0: Trend of Tenancy Determination (2007 - 2016) Source: Authors' fieldwork (2017)

2. Trend of tenancy determination

Considering the trend of tenancy determination as shown in Fig 1.0, the trend was increasing generally for block of flats and tenement properties. Termination of tenancies in block of flats appeared to be the most significant. This was followed by tenement, bungalow, duplex and lastly the semi-detached. The trend for bungalow, duplex and the semi-detached properties were slightly stagnated as if they did not respond to tenancy turnover. This is probably because the property categories belonged to high income tenants who usually have higher capacities to contain recession so that their tenancies remain intact. Such properties were also less common in the property market unlike block of flats and tenement that dominated every sector of the metropolis.

CONCLUSION AND RECOMMENDATION

The study found that there was increasing trend of tenancy determination which portends problems for property management practice and the stakeholders especially the property managers, landlords and tenants. For property managers, it may reflect poor or lack of adequate experience of property management practice and may result into loss of fees, loss of reputation and loss of clients. For landlords, it reflects inappropriateness of investment resulting in loss of expected rental income, increased expenses on repairs, maintenance and security. For tenants, it reflects tenancy non-sustainment resulting in unwarranted breakdown of tenancies and at times failure of tenancies. This may involve tenant eviction with its attendant problems like loss of personal effects, dislocation of family members, tenant's relocation problems, etc. Unless a pragmatic approach is taken, to reduce the trend, housing market/supply is heading towards a problematic destination. The investor/landlords would be discouraged. The tenants would find it difficult to get a suitable accommodation.

The overall effects of diseconomies in the housing sector would set in, and this may also affect productivity generally in the country.

To reduce the incidence and problems associated with tenancy determination as well as improving upon the practice of property management, the property managers should be more critical in their tenant selection process. They should be very mindful of the prospect's ability to pay not only the first rent, but also the subsequent year's rents. Proof of stable employment, good credit history and reliable source of income could be possible indices for evaluating prospective tenants. Guarantee of good behaviour from reputable referees should be obtained from prospective tenants. Optimum rents should be fixed to encourage landlords, while prospective tenants should be advised to take properties with easily affordable rents considering their obligations under the tenancy vis-à-vis their income level.

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RESIDENTIAL PROPERTY INVESTMENT RETURNS INEQUALITIES IN ILORIN

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One of the important investment decisions is the issue of realisation of the returns on the capital invested. Critical decision on increase of returns in property investment as well as factors which determine the level of returns and impact upon the attractiveness of a residential property investment allows capital owners to make effective and rational investment decisions. This study investigates, the influence of infrastructural facilities on residential property investment returns in Ilorin, Nigeria, The sample frame for the study is 762 across the selected neighbourhoods in Ilorin and the Cochran (1963) formula calculation was adopted to arrive at 317 as sample size. The data collected was subject to quantitative analysis with data handling techniques using; Co-efficient of Variation, Mean, Standard Deviation and Sharpe index to test the relationship between the average return, annual income of residential property in Ilorin. The study revealed a high positive linear correlation between infrastructure and the residential property investment returns; an indication that the infrastructure reasonably predicts residential property investment returns. The study also demonstrated that the availability of functional urban infrastructure leads to property gains which relatively create high residential property investment returns.

Keywords: Residential Property Investment, performance, Returns and Infrastructure.

INTRODUCTION

The significance of infrastructure in an urban economy cannot be downplayed because it plays a vital role in the growth and development of any urban setting and this in-turn creates attraction for all forms of investments with the inclusion of real estate investment. Development of property investments performance indicators such as value indices, yields and total returns promote improvement in the analysis of the residential property investment returns to a large extent and the effects of infrastructure creates one of the platforms upon which the profit or returns on real estate investment stands. All over the world, lack and inadequacy of infrastructure is among one of the worst nightmares bedeviling real estate investment because it has the capability to erode the value of corporate earnings in form of returns on investment and devalue the purchasing power of the real estate investors. Tomlinson (2001)

Bello (2006) Property investment is a real property that has been purchased or by way of construction with the intention of earning a return on the investment either through rent, the future resale of the property, or both. An investment property can be a long term endeavour, such as an apartment building, or an intended short term investment in the case of flipping (where property is bought renovated and sold at a price). John (1998) Property investment is like any other investment, the goal is to generate profit. In real estate, the goal is achieved through income (rent for example) or through a profitable sale of the constructed or renovated ones. Returns on property investment indicate the percentage of the invested money returned to a property investor after the deduction of associated costs.

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Other property investment indices are, price base index, level and type of information index and market capitalisation index. The returns on property investment on the other hand, is dependent upon many characteristics associated with that property such as physical characteristics of property; location of the site in relation to employment centers and other facilities, accessibility and economic characteristics of neighborhood. There is realization that real estate is a major source of capital appreciation and a good hedge against inflation, the real estate market is coming close in popularity and importance to the money and capital markets. Empirical studies have also suggested that one of the principal reasons investors favour property investment relative to other investment media has been attributed to the superior investment performance (Coyne et al. 1980; Ibbotson & Siegel, 1984; MacGregor 1992; Anushree 2013, & Hoesli and MacGregor, 2002).

It is on the above premise that, this study examined the relationship between the availability of infrastructure and real estate development for investment purposes in Ilorin the Kwara State Capital. This is done to determine, mostly, the effect of infrastructure on residential property investment returns in some selected neighbourhood in Ilorin. The low performance of residential property investment returns is attributed to inadequate infrastructure. In other word, the property investment indices already developed have not adequately captured the condition of infrastructure in the selected areas. The returns on residential property investments cannot be viewed as being sustainable due to inherent problem of inadequate and functional deficiency in housing infrastructure.

This study covers residential properties developed for investment purpose in some selected neighbourhoods of Ilorin. The study area is categorised into low, medium and high densities residential areas and nine residential neighbourhoods are chosen. This study is restricted to residential properties meant for investment purposes in Ilorin for the period of 2008 to 2017.

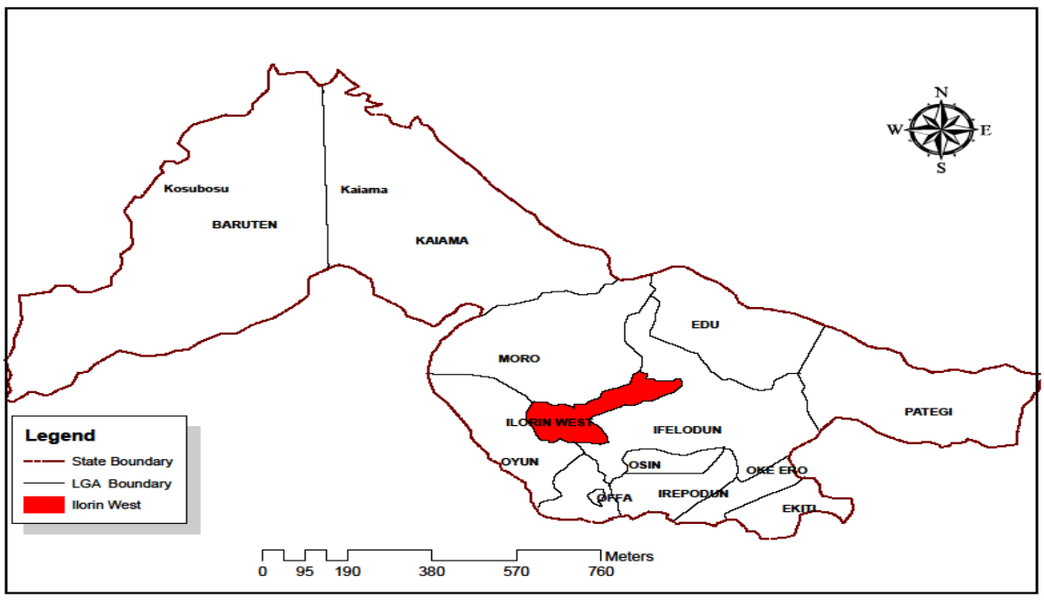


Figure 1: Map of Kwara State showing Ilorin, the State Capital
Source: Kwara State Bureau of Land and Housing, (2017)

The Concept of infrastructure

Ajayi (1998) asserted that investment is the act of laying out money or capital in return for a future reward. He further explained that the anticipated reward from investment may be in form of an income flow or by the receipt of a single capital sum or a combination of both; and that investment may not guarantee returns and it may not involve the investor in furthering action to obtain returns. According to Ogbuefi (2002), investment can be seen as parting with present capital in return for future income. Essentially the primary purpose of investment is the future income. The income an investor expects from an investment can take two basic forms; income earned in form of interest, dividends and profits realized from appreciation in value and rents from the investment. Ogbuefi (2002) also classified investment into two; financial assets and non-financial assets. Investment, as indicated by Olujimi and Bello (2000) is expenditure of an existing capital sum in anticipation of future benefits. If the benefits are measured in monetary term it may be in form of annual income if the investment is retained; or profit on the sale of such investment. For the analytical purposes, the return of benefits from most investments is measured in monetary terms.

However, a rational investor is expected to minimize risk in order to maximize returns from his investment. To ascertain the level of return from an investment, there is need to appraise comparatively the return from the subject investment with alternative investments, understanding its nature outlets, strength and weakness. Investment can be regarded as an act of laying down or surrendering the present capital with the expectation of reaping the benefits in future in form of returns which habitually takes the form of an income flow and capital increase (Payne & Holt 2002).

According to Leonard (2011), a return is the gain or loss of a security in a particular period. The return consists of the income and the capital gains relative on an investment and it is usually quoted as a percentage. The general rule is that the more risk one takes in an investment, the greater the potential for higher returns and losses as the case may be. It must be noted here that, while some investors will settle for principal protection, most investors are in search of return, specifically alpha returns (chief or dominant). Alpha returns are generated when an investment generates more money than its costs. In general, there are three different types of return on investment, return on equity and return on assets. Each one is essentially calculated the same way, but the inputs have different labels.

Property Investment Returns: The market Approach

Time-weighted rate of returns (TWRRs) for the sub-periods are chain-linked or compounded together to get the time weighted rate of return (TWRR) for the whole measurement period. Dubben and Sayce (1991) time-weighted rates are calculated every time a cash flow occurs, and every time rent is received on a property or expenditure the return to that point in time is calculated and is regarded as the return for that period. Subsequently, the return may be chain-linked together to give total return or time weighted rate of return. In this sense return for a period is therefore a geometric mean for given number of properties held as investment. The time weighted rates of return is defined as geometric mean of rates of return achieved over each period contained in the holding period and thereby additional capital injections are to be included into the cash flows and into the capital at work. Time-weighted rate of return is the single rate of compounding interest which will produce the same accumulated value over more than one period as would be produced by the component single period interest rate. The approaches to property investment returns have been used in several studies (Daniel et al, 2014; Umeh & Oluwasore, 2015), developed empirical analysis of total, capital and income returns in Akure. The analysis of trend revealed that total returns overlapped both capital and total returns. Therefore total return is the sum of both capital and total returns. Umeh and Oluwasore (2015) adopted the use of total return indices as a basis for the modeling the influence of inflation. The various approaches to property return are as follows:

Return from Growth

The simple growth rate is a function of past and present values of the property investment; it is calculated by subtracting the past value from the present value and then dividing by the past value. The formula is

$$\text{Return from Growth} = \frac{(\text{Present Value of Investment} - \text{Past Value of Investment})}{\text{Past Value of Investment}}$$

Capital Return

Capital or market return may be defined as the amount of money which may be obtained for an interest at a particular time from those individuals who are willing to purchase it. It has already been established that those willing and able to purchase property for investment require a return in form of rent per annum (Isaac & Enever, 2002). However the investor may incur outgoings, which are annual expenses such as management cost and repairs. This may be deducted from the rent to give the amount which constitutes the true return – income per annum.

$$Capital\ Return = \frac{CV_t - CV_{t-1}}{CV_{t-1}}$$

Total Return

When measuring performance of an investment, the actual rate of return of such investment or a pool of investment over a given evaluation period of time which includes interest, capital gains, dividends and distributions realized over a given period of time referred to as total

return. Total return accounts for two major categories of income including interest paid by fixed-income investments, distributions or dividends and capital appreciation, representing the change in the market price of an asset.

Total return is the amount of value an investor earns from a security over a specific period, typically one year, when all distributions are reinvested. Total return is expressed as a percentage of the amount invested. For instance, a total return of 29% means the security increased by 20% of its original value due to a price increase, distribution of dividends (if a stock) coupons (if a bond) or capital gains (if property investment or fund). Total return is a strong measure of an investment's overall performance (Shipley, 2000; Nweke, 2000).

$$Total\ Return = \frac{CV_t - CV_{t-1} + NI_t}{CV_{t-1}}$$

Income Return

Income return is that portion of a fund's total returns that was derived from income distributions. Income return will often be higher than capital return for bond fund and property investment but typically lower for stock funds. Adding the income return and the capital value return together will produce the fund's total return. It also represents the percentage of the total return generated by the income from property, funds, or account operations (Oyenuga, 2006). Shipley (2000) postulated that, in property investment analysis, the volume of the cost incurable and expected returns analysis are of paramount importance because they necessitate actual investment planning. Planning concerns the future of the real estate investment and the decisive factor are usually sale, lease, and letting.

Urban Infrastructure and Property Investment Returns

Hammer et al (2000) stated that the provision of adequate infrastructure is central to property investment values. Johnson et al., (2005) opined that one of the determinants of property investment value is infrastructure, the contribution of infrastructure results to capital or value appreciation in property investment. Corgel *et al.* (1998) asserted that infrastructural projects abandonment would always affect property investment values in the vicinity. Infrastructure, such as water, energy, roads development, transport networks, information, and communication technology for sustainability and these urban services also positively influence the value of real estate as they improve housing conditions and quality (Famuyiwa and Otegbulu, 2012).

Ajakaiye (2008) revealed that the presence of facilities in a building cause high preference, keen competition for properties and thus, high rental values, while the absence of facilities results in low patronage, disincentive to people, attraction of poor tenants and consequently, low rental values. Donald (2007) were of the view that when infrastructure works, productivity and labor increase; when it does not work, economic renewal can be postponed or even halted. Ge and Du (2007) opined that property returns is an essential aspect of property markets worldwide and determined by a variety of infrastructural factors and the determination of those factors is a significant part of property valuation.

The findings from previous studies have given credence to infrastructure as a life engine to real property investment and it is central to property investment value. The several findings and submissions from empirical studies on infrastructure and property investment gave clear cut evidence that, there is strong significant relationship between the infrastructure and rent on property investment (Ajibola et al. 2013, Olujimi & Bello, 2009; Olujimi, 2010, Gatauwa & Udoka, 2014; Walter, 2009; Samjay, 2013; Ian, 2012; Ajayi *et al.,* 2014) but this study used analyse differences in returns residential properties across the studies areas which previous studies are yet to be addressed.

RESEARCH METHODOLOGY

The target population for this study comprises of residential properties in Ilorin which are mainly owned for investment purpose and which are capable of generating income to the property owner or investor in form of rent and sale. The sample population is the of residential-rental properties in the selected areas in Ilorin. The residential properties include two and three bedrooms which are bungalow as the case may be. The numbers of residential apartments were collected through physical survey of the selected neighborhoods. First, the total number of houses in the selected neighbourhoods was collated from the number of

registered houses with the Power Holding Company of Nigeria (PHCN) in each of the neighbourhoods of the study areas after which Ground-truthing was carried out to update and verify the data from PHCN, along with identification of residential rental properties within each of the selected neighborhoods across the study areas. The sample frame for the study letting and sale transactions are 3,419 and 702 respectively across the selected neighbourhoods. Cochran (1963) formula for sample size calculation was adopted; in order to have a good representation for the study areas. The model is described below:

$$\underline{n0 = Z^2pq}$$
$$e^2$$

where n_0 represent sample size, N represents population size, p represents 95% confidence level of the population, q = 1-p, e represents acceptable error, Z = 1.96 which is referred to as the standard normal deviation. Therefore, the sample size for the 762 letting transactions and 317 sales transactions were sampled across 23 registered firms in Ilorin (NIESV, 2016).

Mathematically, the analytical methods used are expressed as follows:

Total Return = $\frac{(CV_1 - CV_0) + R}{CV_0}$

Income Return = $\frac{Rent}{Capital\ value} * 100$

Capital Return = $CR = \frac{(CV_1 - CV_0)}{CV_0}$

Coefficient of Variation = $\frac{Standard\ Deviation}{Mean}$

Sharpe Index = $\frac{Mean - Free\ Risk\ yield}{Standard\ Deviation}$

The higher the Sharpe Index the better, the performance.

DATA ANALYSIS

Table 1 shows the mean annual total return of 2 bedrooms residential property range from 9.79% to 1.96%, and the highest return was found in Basin Area at 9.79%. Basin area had highest in income return at 2.82% and capital return at 6.97. Basin constitute major area of property investment with highest returns.

Table 1 Return on 2 Bedrooms Residential Property Investments (2008-2017)

	Total Return in %	Income Return in %	Capital Return in %
Basin Area	9.79	2.82	6.97
Sabo-Oke	4.79	1.17	3.62
Unity Area	2.59	1.01	1.58
Gari Alimi	5.03	1.17	3.86
Oniganga	4.23	1.87	2.36
Tanke	5.65	1.38	4.27
Fate	4.13	0.75	3.38
GRA	4.74	2.09	2.65
Olooje	1.96	0.43	1.53
Adangba	4.46	0.98	3.48
Ita-Amodu	4.62	0.68	3.94
Centre Gboro	1.96	0.01	1.95
Garage Offa	4.49	1.02	3.47
Gaa Akanbi	6.04	0.61	5.43
Pipe Line	2.33	0.84	1.49
Taiwo Oke	3.07	0.38	2.69
Omoda	1.96	0.64	1.32
Kulende Area	4.01	1.05	2.96
Sango	2.36	0.59	1.77
Mean	**4.12**	**1.03**	**3.09**

Source: Authors' Field Survey, 2017

Table 2 shows the result of analysis of variance showed that there is statistically significant difference in returns across the study areas at p-value (0.000) less than 0.05 level of significant. Therefore, this further suggests that the returns across the areas are unequal due to difference in market factors.

Table 2 Analysis of Variance in Returns in 2B/R

Source of Variation	*SS*	*df*	*MS*	*F*	*P-value*	*F crit*
Between Groups	94.15599	2	47.07799	23.08218	0.0000	3.168246
Within Groups	110.1374	54	2.039581			
Total	204.2934	56				

Computed from Table 1

Table 3 shows the mean annual total return of 3 bedrooms residential property and the highest return was found in Basin Area at 10.87%. Garrage Offa had highest in income return at 6.56% and Adangba had highest capital return at 7.14. Basin constitute major area of property investment with highest returns.

Table 3 Return on 3 Bedrooms Residential Property Investments (2008-2017)

	Total Return in %	**Income Return in %**	**Capital Return in %**
Basin Area	4.9	2.22	2.68
Sabo-Oke	10.87	4.86	6.01
Unity Area	8.12	2.86	5.26
Gari Alimi	6.46	2.4	4.06
Oniganga	4.61	2.07	2.54
Tanke	8.43	3.56	4.87
Fate	5.45	1.86	3.59
GRA	4.21	1.4	2.81
Sango	7.21	1.47	5.74
Adangba	9.21	2.07	7.14
Ita-Amodu	9.21	3.02	6.19
Centre Gboro	3.66	1.1	2.56
Garage Offa	8.57	6.56	2.01
Gaa Akanbi	5.31	2.26	3.05
Pipe Line	3.36	0.73	2.63
Taiwo Oke	5.19	2.01	3.18
Omoda	2.45	0.49	1.96
Kulende Area	2.2	0.54	1.66
Mean	**6.08**	**2.30**	**3.77**

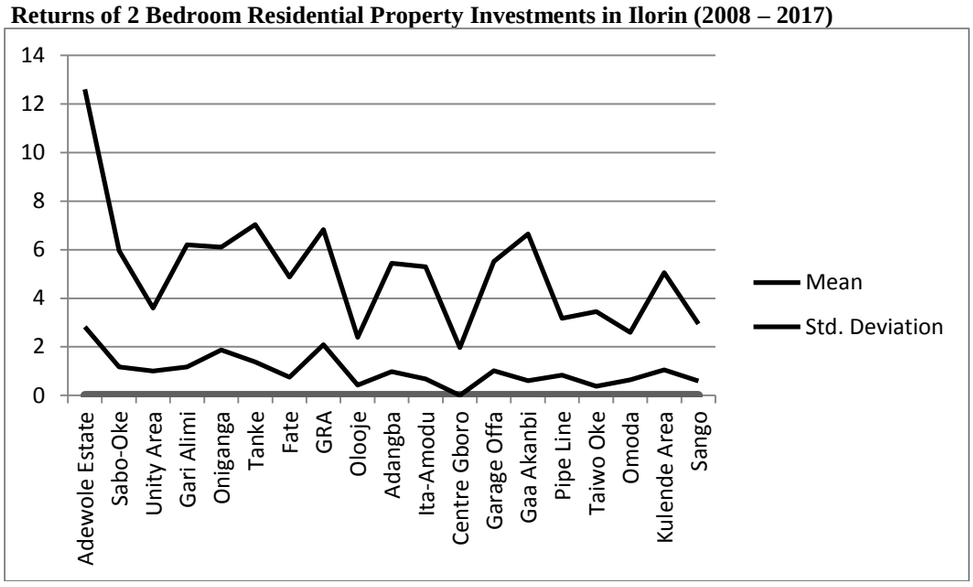
Source: Authors' Field Survey, 2017

Table 4 shows the result of analysis of variance showed that there is statistically significant difference in returns across the study areas at p-value (0.000) less than 0.05 level of significant. Therefore, this further suggests that the returns across the areas are unequal due to difference in market factors.

Table 4 Analysis of Variance in Returns in 3B/R

Source of Variation	*SS*	*df*	*MS*	*F*	*P-value*	*F crit*
Between Groups	130.3068	2	65.15339	16.85021	0.000	3.178799
Within Groups	197.1977	51	3.866621			
Total	327.5044	53				

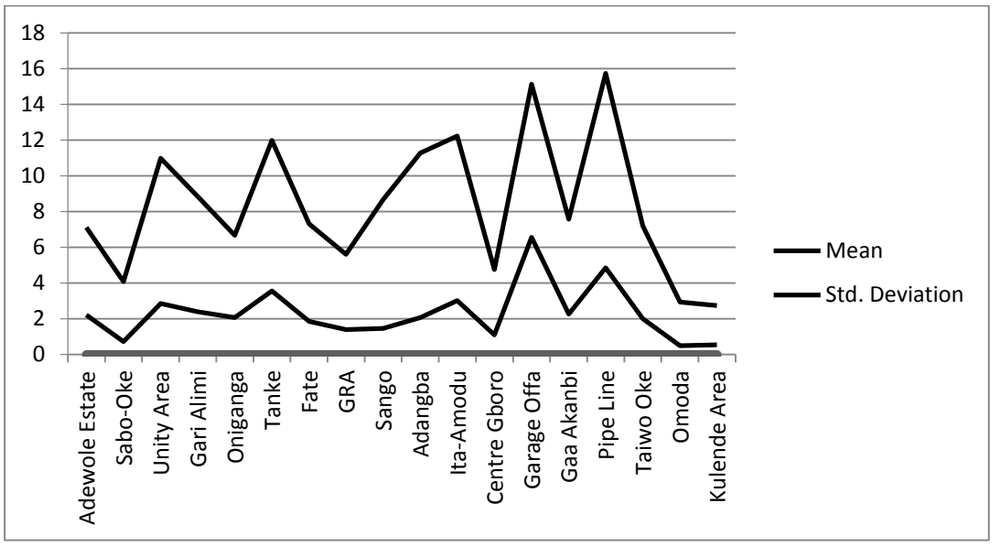
Returns of 2 Bedroom Residential Property Investments in Ilorin (2008 – 2017)



Returns of 2 Bedroom Bungalows in the selected areas of Ilorin

The results above show the analysis of total return on 2 bedrooms residential property. The average return shows that Basin area has highest average return at 9.79%, Tanke has 5.65% and Gari Alimi has 5.03% average return while Olooje, Centre Gboro and Omoda have 1.96% as the lowest return. On this note Adewole Estate performed better than any other location but the market is not stable because the differences between nominal mean and geometric mean at 9.79% and 2.82% respectively is too wide. Therefore this makes Gari Alimi and Tanke a better investment market than any location for 2 bedrooms residential property investments in Ilorin.

Returns of 3 Bedroom Residential Property Investments in Ilorin (2008 – 2017)



Returns of 3 Bedroom Bungalows in the selected neighbourhoods of Ilorin

The above shows the analysis of total return on 3 bedrooms residential property. The average return showed that Pipe Line has highest average return at 10.87% and Unity Area has 8.12% average return, Omoda and Kulende Area have the lowest average return of 2.45% and 2.2% respectively. On this note Pipe Line performed better than any other location like Kulende and Omoda. This makes Pipe Line a better investment market than any location for investor in 3 bedrooms residential property investments in Ilorin.

CONCLUSION AND RECOMMENDATIONS

From result, Adewole Estate was identified as a better market for 2 bedrooms residential property investment compared with other neighbourhoods in ilorin with an average return of 9.79% and a risk of 7.2%. The investment market was also found to be less volatile and as such the best for the investment of 2 bedrooms residential property. Investors can

conveniently invest their resources in Tanke for 2 bedrooms residential property and make good profit from the investment.

Pipe Line performed better in terms of providing high return for 3 bedrooms residential property at 10.87%. The investment market is less volatile and risky. Conclusively, residential property investment performed well with positive mean returns throughout the period under review. The result of the analysis indicates that returns on residential properties are higher with 9.79% for 2 bedrooms and 10.87% for 3 bedrooms are encouraging as Ilorin is still growing in terms of real estate

With reference to this study and its findings, the following recommendations are found worthy for the full utilization of the accrued benefits derivable from this research. They include: Estate Surveyors and Valuers should keep a database on the return from property investment so as to adequately advise property investors on the type of property to invest in a particular location. Tanke as an investment market is good for the investment of 2 bedroom residential property and it is less risky when compared with other neighbourhoods. Pipe Line as an investment market is good for the investment of 3 bedroom residential property when compared with other areas in Ilorin. Investors who are risk adverse can invest in Tanke investment market for 2 bedrooms residential property as it performed better than other location with a less risk. The supply of residential property should be checked as it may soon overtake the demand leading to the problem of void.

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SUSTAINABLE ARCHITECTURAL DESIGN

EFFECTIVENESS OF PASSIVE DESIGN FEATURES IN ACTIVE SECURITY INSTALLATION IN LARGE SHOPPING CENTRES IN ABUJA, NIGERIA

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Nigerians have been witnessing a class struggle among developers and investors competing for who builds the largest shopping centres. However, some of these shopping centres are being abused by a few patronisers who hide under the guise of shopping to engage in some indecent and criminal activities. The shopping centre business concept has not only boosted the country's gross domestic product (GDP) and created jobs but has provided recreation and relaxation centres for those who have the financial capacity to patronize them. A major challenge is that the building design and security planning phases of most of these shopping centres seem to be running independently of each other, as opposed to working together to achieve a fully secured building. This paper examines the effects of passive design features on active security installation in large shopping centres. To achieve the desired objectives, data obtained through primary and secondary sources comprised the use of structured observation schedules and questionnaires. A total of 240 questionnaires were distributed to security personnel in 30 selected shopping centres using a stratified sampling method. Descriptive statistics was used to analyse the data obtained. The results showed the level of effectiveness of the existing passive design features in the installation of security elements. It is recommended that the design of shopping centres bearing cognizance of passive design should extend to the provision of maximum security.

Keywords: building, effectiveness, passive design, security, shopping centres.

INTRODUCTION

Prior to the twentieth century, the only way to control indoor conditions was through passive means. The hot-dry climate poses environmental challenges of high temperature and this extreme temperature must be catered for at the design stage to avoid absolute dependence on active energy systems for comfort within buildings (Akande, 2010). Passive design refers to the design of a building and the space within it to benefit from natural light, ventilation and even temperatures. It responds to site conditions and local climate to maximize building users' comfort, health and safety by minimizing energy use (Jaques, 2008). Passive design is an approach to building design that uses the building architecture to minimize energy consumption and improve comfort (Boake, 2011). The building form and thermal performance of building elements (including architectural, structural, envelope and passive mechanical) are carefully thought out and optimized for interaction with the local microclimate (Napier, 2015). The ultimate vision of passive design is to fully eliminate requirements for active mechanical systems (and associated fossil fuel-based energy consumption) and to maintain occupant comfort always. There is no doubt that the "large shopping centre" culture has caught up with Nigerians, especially those resident in the cities and urban areas (Borg et al, 2015).

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For more than a decade now, there has been a class struggle among developers and investors competing for who builds the biggest shopping centres. The new business concept has not only boosted the country's gross domestic product (GDP) but it has also created jobs and provided business and relaxation centres for those who have the financial capacity to patronize them.

Large shopping centres in Nigeria are places where people not only come to shop, but also to hang out, engage in window or mystery shopping and savour the chilling ambience (Ezea, 2017). The large shopping centre culture has in some way broken the status barrier that used to be so obvious in the country as most middle-class people can now go into shopping centres and feel a sense of belonging. However, some of these shopping centres are now being abused by some patronisers who hide under the guise of shopping to engage in some indecent and criminal activities. Prominent among these are unsuspecting hoodlums who disguise as customers, sometimes dressed corporately and positioned in strategic places within these centres.

Security in buildings comprises three key objectives: to detect the presence of threat, to deter its occurrence, and to respond accordingly (Kovacich et al, 2012). Electronic surveillance, in its current conception and use, meets primarily the first two objectives. Active security measures include visual assessment of an alarm or event, area surveillance and monitoring, and deterrence. Response, which is the ability to respond to or intervene in a threat, has room for further development. Many times, security is tied to negative connotations and notions like threats, crime, fear, control, loss of privacy, discrimination, inequality, and insensitivity. Such perceptions overpower security's positive energies that are linked to its definition as "freedom" as well as the goals of security schemes to reduce fear and improve quality of life. Designs that do not consider active security must rely on extensive and costly security systems to maintain adequate surveillance, which may or may not even be comfortable. Furthermore, even the most efficient technologies will use more energy than is necessary with a poorly designed building. Hence, this research proposes the integration of active security with passive design features as a means to connect people to people safely and people to the environment.

Overview of Shopping Centres

A shopping centre is a product of the real estate industry, created by intentionally aligning the location, customer mix and tenant mix (Reikli, 2012). Shopping centres originally stemmed from old covered market places that were common between the 10th and 15th centuries, and are even still functional today in many parts of Nigeria. Through the 1950s, large indoor shopping malls began to spring up in major cities across the world, with the first ones springing up in the United States and other famous ones being built in Paris and London. The period between the 1980s and 2008 saw large shopping centres begin to give room for factory outlet centres (where manufacturers could sell their own products at discounted prices. (Haynes and Tilpade, 1996; Kang and Kim, 1999). Shopping centres began to incorporate entertainment in different forms such as live music, cinemas, food courts, robotic animal displays and other interactive merchandising techniques. It was in this period that shopping centres began to spring up in large numbers in Africa, the idea fast selling among the middle and high class in the big cities (Diyan, 2015). The current largest shopping centre in Africa is the Mall of Africa in South Africa, which opened in April 2016 with 131,000 square meters of retail space. Currently, a good number of shopping centres in Nigeria serve as popular hangouts and meeting points for people of various calibres, especially during weekends and holidays. The Federal Capital Territory has the advantage of being well-planned over many other cities in the country. As a result, all manner of residents have various needs that seek to be met. Common to see are foreign names like Shoprite, Park and Shop, Game and Cold Stone which have taken advantage of the high demand for retail space that is fuelled by the growing populace with considerable buying power.

Security in Shopping Centres

Historically, the notions of security and surveillance have been closely linked with natural surveillance (which is the ability to see what is happening) as a means of achieving security. Relying heavily on the physical dimension, both security and surveillance fell within the domain of architects. Security refers to a state of calmness or the condition that is tied to the lack of feelings experienced by those who are afraid or threatened. Its reference to freedom further defines the term's universal character, aligning security within basic human rights

and needs (Caldas, 2008). Offenders will most times make best use of crime opportunities, and therefore, those chances must be avoided (in the first place) or removed (following the advent of a crime problem) (Armitage, 2014). Security actions that are intended to deny unauthorized access to buildings, equipment and properties, and to protect personnel and property from damage or harm (such as unwarranted spying, theft, or terrorist attacks) are more commonly referred to as physical security (Fennelly, 2012). This makes use of systems like CCTV surveillance, security guards, protective barriers, locks, access control protocols, and many other techniques which are inter-reliant on each other for effective security to be accomplished.

Passive Design Features for Active Security Installation

Passive design features for active security installation specifically refer to design essentials that can be merged with security features to maximize comfort and security and the needed privacy with little or no increase in energy consumption (Jaques et al, 2008). These features can be categorised into four main elements, namely deterrence, intrusion detection and electronic surveillance, access control and security personnel. The aim of deterrence is to sway potential attackers into thinking that a successful attack is unlikely by reason of strong defences (Manaugh, 2016). Examples in physical space include tall fences topped with barbed wires, restricted access points, vehicle height-restrictors and security lighting. These help to delay, make difficult or totally prevent intrusion. Intrusion detectors comprise of alarm systems and sensors and video surveillance systems Atlas, 2008). Alarm systems work hand in hand with physical barriers and security guards to activate response when the other forms of security have been breached. Surveillance cameras are useful for incident authentication and a historical breakdown. Access control methods are used to observe and control traffic through specific access points and areas of the building (Pearson, 2011). They comprise of turnstiles, security doors and gates. Security personnel perform many functions: as patrols and at checkpoints, to administer electronic access control, to respond to alarms, and to monitor and examine videos.

RESEARCH METHOD

Data for the study was obtained using an observation schedule purposefully structured to provide sufficient and relevant information for the analysis of the study. The paper is majorly aimed at providing information regarding the level of effectiveness of passive design features in active security installation within large shopping centres in Abuja, with a view to proffer design solutions that will enhance security. The study sample was selected from Abuja Municipal Area Council using the stratified random sampling method because Abuja has many shopping centres. In totality, thirty shopping centres were selected based on the following criteria that define a large shopping centre in Nigeria:

1. One or more buildings forming a complex of shops
2. Interconnecting walkways
3. Presence of anchor stores
4. Serving an estimated primary area of 4.8-9.7km
5. A strip configuration, or L- or U-shaped configuration

The elements observed include the type of gates (pedestrian and vehicular), fences, entrance doors, window styles and materials, access control type, style of staircase, location of video surveillance system, buffer spaces, landscape consideration, space planning and lighting adequacy. A questionnaire was administered to security personnel who were placed in charge of surveillance within the selected shopping centres. They were required to rate selected variables that related to the effectiveness of passive design features in active security installation within the shopping centres. Although 240 questionnaires were prepared, a total of 221 security personnel participated in the study and their opinions were collated using a Likert scale. The data obtained was gathered, sorted and analysed using SPSS while the results are represented in form of tables, charts and plates to further buttress explanations within the result discussion.

DISCUSSION OF RESULTS

This objective formed the basis for the questionnaire that was developed. The objective was to assess the level of effectiveness of passive design features in active security installation.

Of the 240 questionnaires distributed, 18 were unanswered, leaving a total of 222 valid questionnaires. Three categories of Likert scales were used to divulge the opinion of security personnel regarding the concerned shopping centres in Abuja.

Frequency of Crimes Experienced at the Shopping Centre and Its Environs

Figure 1 shows the frequency of crimes experienced in large shopping centres in Abuja, expressed as a percentage of crimes generally common to shopping centres of this magnitude around the world. From the questionnaires administered to security personnel, theft was found to be the most common crime among shopping centres, followed closely by retail shrinkage. It can be observed from Figure 1 that theft is the crime that occurs the most, among all other crimes. Other crimes like kidnapping and murder do not have records of occurrence in the selected large shopping centres.

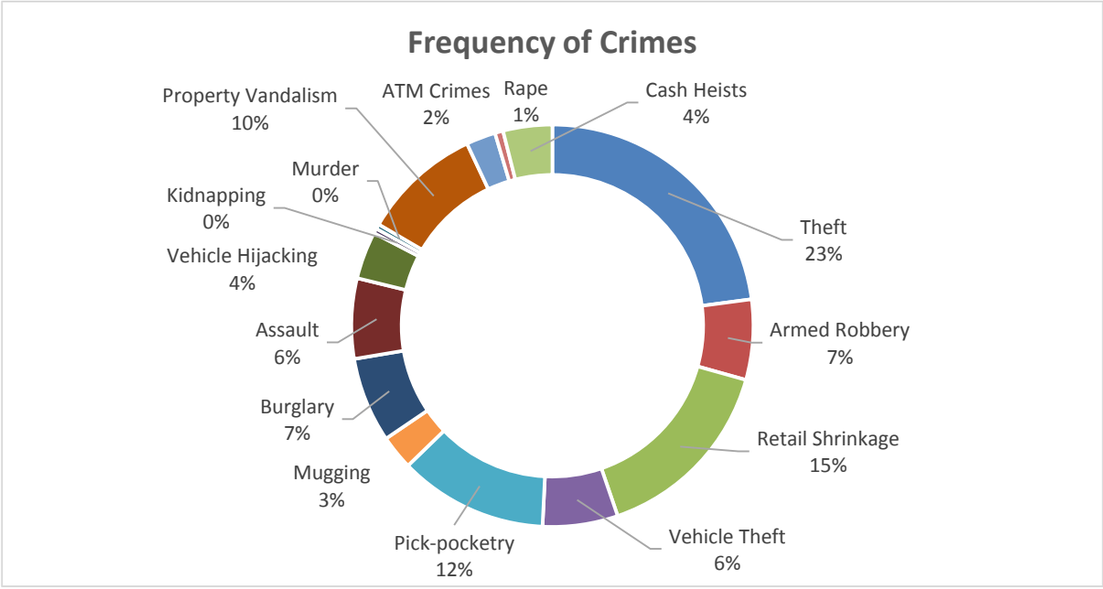

Figure 1: The Frequency of Crime Experienced Within Shopping Centres in Abuja

The range of values for each option of crime frequency is as follows:

Never	1.0-1.49
0-3 months	1.5-2.49
4-6 months	2.5-3.49
7-9 months	3.5-4.49
Over 9 months	>4.5

Table 1.0 shows that theft and retail shrinkage are the most frequent crimes that occur in large shopping centres, occurring as frequently as 4-6 months. Other crimes like pick-pocketry, property vandalism, burglary, armed robbery, vehicle theft and assault may have occurred at some point, but not as frequently as the las two crimes on the table.

Table 1.0 Respondents opinion on frequently occurring crimes

	Measured Variable	Number of Respondents	Sum	Mean	Interpretation
1	Kidnapping	221	230	1.04	Never
2	Murder	220	231	1.05	Never
3	Rape	218	238	1.08	Never
4	ATM Crimes	221	279	1.26	Never
5	Mugging	220	284	1.3	Never
6	Cash Heists	219	293	1.32	Never
7	Vehicle Hijacking	220	315	1.43	Never
8	Assault	220	341	1.55	0-3 months
9	Vehicle Theft	220	377	1.7	0-3 months
10	Armed Robbery	221	394	1.79	0-3 months
11	Burglary	221	402	1.83	0-3 months
12	Property Vandalism	221	454	2.05	0-3 months
13	Pick-pocketry	221	478	2.17	0-3 months
14	Retail Shrinkage	221	553	2.54	4-6 months
15	Theft	221	653	2.95	4-6 months

Level of Risk of Shopping Centre Assets

Table 2.0 shows the spread of the respondents with regard to the frequency of risk faced by shopping centre assets. It can be deduced that the riskiest assets in most shopping centres are the merchandise. This directly translates to theft, which is the most common crime confronted by Abuja shopping centres.

A Likert scale of 4 was used which ranged from "Very High Risk" to "Very Low Risk". The range of values for each option of crime frequency is as follows:

Very High Risk 1.0-1.49

High Risk 1.5-2.49

Low Risk 2.5-3.49

Very Low Risk 3.5-4.49

A list of crimes is shown against the respondents' opinion on the shopping centre assets that stand the most risk. Based on the opinion of 221 respondents on average, cash is the asset faces the highest risk in a large shopping centre. Table 2.0 displays the shopping centre assets in a ranked order of risk from highest to lowest. It can be deduced that cash, safes, vehicles in the parking lot and merchandise face a high risk of being stolen or tackled by intruders. Among these four, cash faces the highest risk in the opinion of the respondents, followed by the safes/vaults where the cash is being kept. Assets that face the lowest risk are the human assets- security personnel, the management, customers and employees. This is because it takes a high level of planning to carry out attacks on human beings within a public space and as indicated, petty thieves are the most common criminals to watch out for in a large shopping centre.

Table 2.0 Respondents opinion on the Level of Risk of Shopping Centre Assets

	Measured Variable	Number of Respondents	Sum	Mean	Interpretation
1	Cash	221	390	1.76	High Risk
2	Safe/Vault	221	466	2.11	High Risk
3	Vehicles in Car Park	221	471	2.14	High Risk
4	Merchandise	221	496	2.24	High Risk
5	Security Measures on Site	221	628	2.85	Low Risk
6	Management	221	640	2.9	Low Risk
7	Customers	220	644	2.91	Low Risk
8	Employees	220	652	2.95	Low Risk

Plate 1.0 displays vehicles parked in a large shopping centre. It is common in the Federal Capital Territory to come across signs that warn vehicle owners of parking at their own risk. This means the shopping centre authorities or security personnel will not be held accountable if the vehicle gets damaged or stolen, or any item saved inside goes missing (Chowdury, 2007). This is the main reason why vehicles face high risk in large shopping centres. It was discovered that some shopping centres go further to dish out parking tickets and demand payment for vehicular parking, but shred off all responsibility in the occurrence of a damaged or missing vehicle. However, some shopping centres were found to have adequately fitted their parking lots with video surveillance systems and a number of security personnel patrolling the lots at different times, thus seemingly providing security to the best of their capability.

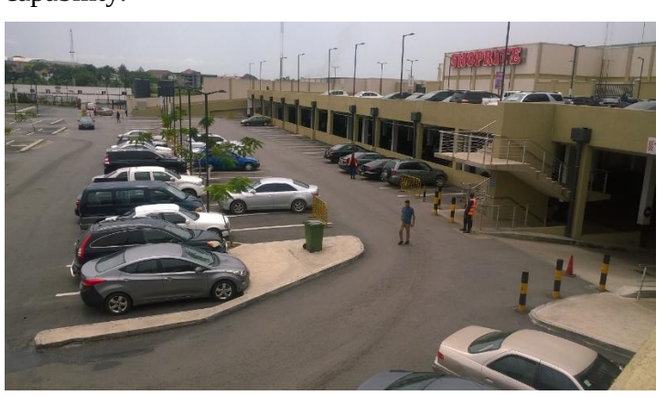

Plate 1.0: Vehicular parking at Jabi Lake Mall Source: Author's fieldwork (2017)

Effectiveness of Response of Security Features within the Shopping Centres

In Table 3.0, a Likert scale was used to rank the level of effectiveness of response by the shopping centre staff. It ranged from "HE" to "HI". The table shows the spread of the respondents with regard to the effectiveness of response by staff in Abuja shopping centres.

The range of value for each option of crime frequency is as follows:

Highly Effective (HE) 1.0-1.49

Effective (E) 1.5-2.49

Ineffective (I) 2.5-3.49

Highly Ineffective (HI) 3.5-4.49.

Table 3.0 shows the level of effectiveness of the passive design features that were observed in actively curtailing crime and aiding security in shopping centres. The most effective feature noted in the selected shopping centres is the location of the restroom entrances. It was observed that all the shopping centres located the restrooms in one or more of the following:

1. A separate, much smaller building allocated to conveniences in the shopping centres
2. Corners that boldly indicated "restroom" yet gave enough privacy to male and female users.
3. Parts of the building that were well-lit and gave no room for loitering.

Other features were ranked as averagely effective as well, with security around entrances and exits and prompt response to customers' call for help topping the list. This indicates that security personnel employed play a vital role in overseeing the proper use of all the passive design features put in place to provide active security in a large shopping centre.

Table 3.0 Respondents opinion on the effectiveness of response of security features within shopping centres in Abuja

	Measured Variable	Number of Respondents	Sum	Mean	Interpretation
1	Location of restroom entrances	220	289	1.31	Highly Effective
2	Security around entrances/exits	221	418	1.89	Effective
3	Prompt response to customers' call for help	221	422	1.92	Effective
4	Location of parking lot	221	447	2.04	Effective
5	Care for the CAR PARK and PUBLIC TRANSIT stop areas	221	461	2.09	Effective
6	Lighting distribution	221	467	2.11	Effective
7	Visibility around car park	221	470	2.14	Effective
8	Movement along stairs and ramps	220	474	2.14	Effective
9	Outdoor security lighting	221	477	2.16	Effective
10	Surveillance around payment counter	220	491	2.23	Effective
11	Car park, stairway and elevator lighting	219	502	2.27	Effective
12	Surveillance around loading dock area	221	506	2.29	Effective

Plates 2.0 and 3.0 show some of the security features installed in large shopping centres. Plate 2.0 displays a box camera installed directly at the entrance to the staff locker-room. The shopping centre management took extra measures to place the staff under surveillance in order to keep them accountable for certain items. In addition to the camera installed, security guards and a machine interface were placed to mark the entrance and exit of staff. These steps taken directly speak to the mindset of staff and discourage any impolite behaviour.

Plate 2.0: Staff checkpoint at the staff locker-room in Grand Square Mall, Abuja
Source: Author's fieldwork (2017)

Plate 3.0 indicates the incorporation of screen mirrors and doors as design features that provide a means of surveillance. The screens strategically face the payment counters and to the oblivious shopper, they look like the regular aesthetic doors and screens but they actually allow for monitoring of the shopping centre activities unbeknownst to shoppers. This passive design feature proved effective in installing the level of security desired behind the screened elements.

Plate 3.0: Security screen mirrors and doors at Apo Shopping Mall, Abuja
Source: Author's fieldwork (2017)

Overview of the Level of Effectiveness of Passive Design Features in Active Security Installation in Shopping Centres in Abuja.

It was observed that the selected shopping centres attempted in different ways to provide security to the most valued assets (like cash and vaults) and the building itself. Open staircase styles, warning signs, enhanced lighting and sensors were used in most of the centres and while these were found to be helpful, the attitude of most of the security personnel seemed laid-back, as they mostly perceived security threats in terms of crimes like terrorist attacks, murder and kidnapping and thus ignored paid little attention to threats in the form of intrusion, loss of privacy and crowds.

In Figure 2, 53% of the crime types assessed occur frequently, while 47% seldom or relatively never occurred. This indicates that the rate of occurrence of petty crimes is on the increase. It spreads beyond the protection of doors and windows and deals with the quality of one vendor's products as opposed to another of a reduced quality. It goes further to tell the social behaviour of a shopping centre.

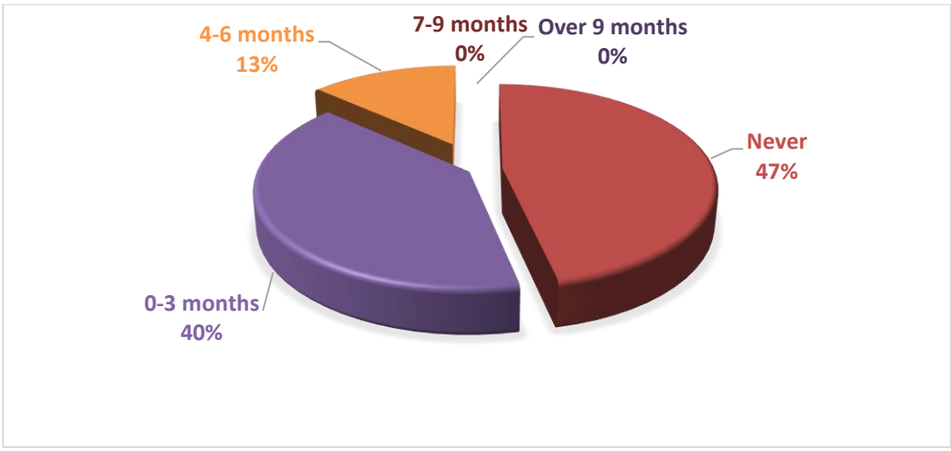

Figure 2: Frequently Occurring Crimes in Large Shopping Centres in Abuja, Nigeria

The level of risk of shopping centre assets is represented graphically in Figure 3, indicating that the higher the mean value of each asset, the lower the risk of threat faced by the tagged asset. Thus, a greater number of the security personnel opined that cash was the asset at the foremost risk in a shopping centre.

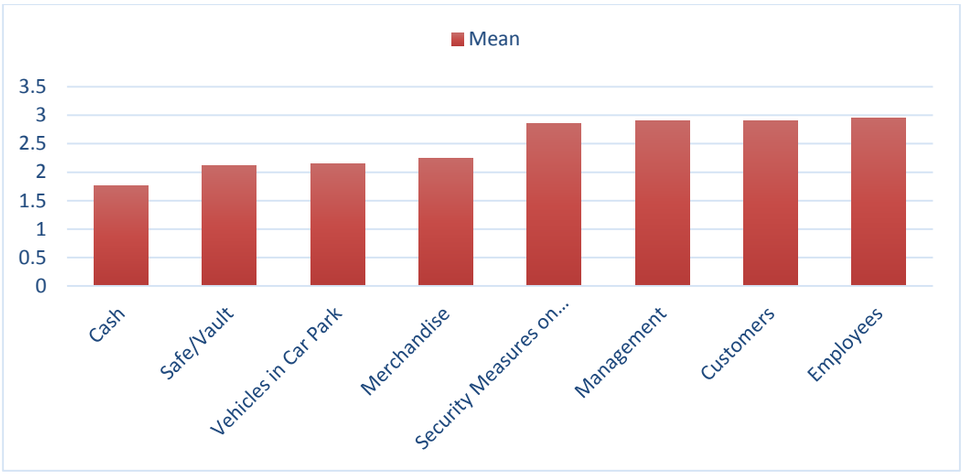

Figure 3: The Level of Risk of Shopping Centre Assets

92% of the security personnel were of the opinion that the available design features in the respective shopping centres were positioned to give the right support to the security measures or installations available, hence the high level of effectiveness as represented in Figure 4.

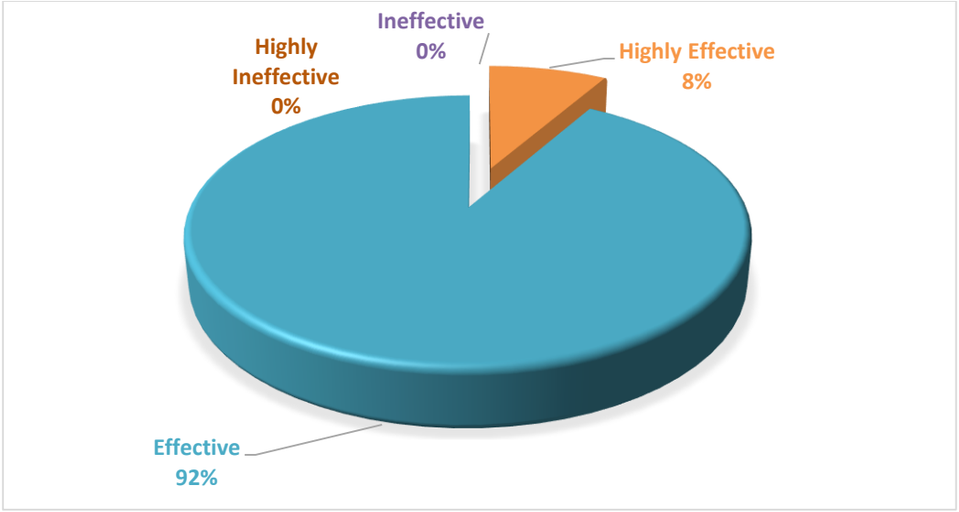

Figure 4: The Level of Effectiveness of Response within Shopping Centres in Abuja

CONCLUSION

The response drawn from security personnel regarding various crime types and targets points towards theft. Petty theft and shoplifting are the main security challenges faced by large shopping centres in Abuja. Although the goods stolen commonly have little value, the act of stealing itself bears negative impact on business persons scouting to set up shops in big

buildings for fear of the safety of their goods. It is common to find video surveillance systems and uniformed security personnel in almost every large shopping centre in Abuja. However, occurrence of petty crimes is still reported on a frequent basis. This means that the intruders or criminals have observed and found a way to boycott these security installations put in place to prevent or oversee crime in the first instance. Thus, there is the need to strategically fit in security installations that will not be obvious to unsuspecting shoppers, but trigger a response by security specialists to discriminate activities carried out within or around large shopping centres.

Recommendations

In refining the level of effectiveness of passive design features in active security installation, the following measures should be deliberated upon:

1. Wall partitions and columns that could create dark areas should be avoided, but where they cannot be avoided, suitable cameras should be latched onto them.
2. Video surveillance and alarm systems should be embedded in the building, landscape and lighting elements to avoid rousing the attention of unsuspecting intruders.
3. Clothes racks and display counters and shelves should be arranged in a way that does not obstruct observation from employees or create hiding spots.
4. False ceilings, floors and walls should be adopted in suitable areas to avoid a predictable design and to provide safe spots from which active surveillance can take place.
5. The adoption of screen mirrors, windows and doors give security personnel the advantage of scanning the surroundings of a shopping centre for any criminal behaviour.

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ASSESEMENT OF STUDENT SATISFACTION WITH PROVISION OF RECREATIONAL SPACES IN FACULTY BUILDINGS IN PUBLIC UNIVERSITIES IN NORTH CENTRAL NIGERIA

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Students and lecturers spend considerable amount of time in the faculty. Student recreation spaces within faculty buildings are mostly unstructured and these spaces are simply put into different uses as the need of student arises at a particular time. The aim of this study is to assess the level of student satisfaction with provided recreation spaces within faculty buildings in Universities. Quantitative research approach was adopted for the study. For the assessment process, two faculties were randomly picked from each of the seven Public Universities within the study area. Observation schedule and Structured questionnaire was used as instrument of data collection. A total of 420 questionnaires was administered to randomly selected students of the faculties. The data obtained was analysed using descriptive statistics and the results was presented in tables, charts and plates. It was found that specific student recreation spaces were not adequately provided and integrated in the faculties. More so, students were not satisfied with the provision of such spaces. The conclusion of the study now is the need to efficiently design faculty buildings with good planning for formal and informal recreation for students. As well as proper integration of the spaces with the main academic activities in the faculty.

Keywords: *Building, Faculty, Recreation, Spaces, Students,*

INTRODUCTION

Faculty building is the backbone of academic activities in institutions of higher learning, it supports learning, teaching and research in Universities. The building consists of a collection of Departments, offices, lecture theatres, lecture halls, faculty members, support services, leisure and recreation spaces (Brown, 2005). The Faculty building consequently has two types of spaces, namely: the formal; and informal learning spaces (Oblinger, 2005). The formal learning space are essentially lecture halls, studios, research rooms, seminar halls and laboratories. These spaces are controlled by already established parameters, such as set hours of use, set number of seats, scheduling requirements and predetermined learning activity patterns that include lectures, presentations and discussions (Akinola, 1985). However, the informal learning spaces are the destinations in between the formal learning spaces. These destinations are the corridors, common rooms, lounges, hallways, terrace spaces, concourses, hallways, courtyards, patio, and opens spaces within the facility. (Knoll, 2013; GSA, 2006; Lansdale, 2011). This consequently forms the transition spaces within the faculty building used by students for informal interaction. Owing to this fact, the challenge for professionals specifically Architects in charge of designing such facility is usually how to functionally integrate the needs for such varied category of users within the faculty, and this is a key consideration to be taken into account in any building design (Zubairu, 2006). In addition, it is important to note that as we design meaningful spaces for learning experience, that faculty building encompasses the full range of places in which learning occurs, from real to virtual, from classroom to outdoor areas (King, et al, 2006).

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In other words, learning should happen everywhere on campus: that is from formal lecture halls to informal spaces. This means that recreational space should be provided in the design of faculty buildings so as to compliment the need for virtual learning, and informal interaction in the faculty, which are usually done out of formal lecture halls (Ellis, 1993). Furthermore, the narratives of the 21st century has made students become increasingly digitally literate (Fournier, et al 2010). As a result, this has created a scenario were students are usually found in multiple areas of academic faculty seated, either just surfing the internet, browsing for an assignment, or simply just working on their tablets or laptops in entrance halls, corridors, courtyards and concourses. All this put together has made learning space in institution to take a new dimension (Steinfeild, 2002).

Spaces in all buildings are expected to be planned for maximum efficiency and functionality when the facility is finally put to use (Onwuka et al 2016), Attention has always been given to formal spaces in faculty buildings. This is usually because of believe that students only come to the faculty to receive lectures, and to do other academic activities only. However, as more studies are evolving, researchers are gradually refuting this narrative (Temple, 2007; Fournier et al 2010) stating in their study that the social and interactive environment greatly influences students leaning process in campuses. This consequently gives the need for provision of spaces that support informal learning spaces in Universities. This therefore, forms the need for provision of student relaxation spaces in faculty building design (Kelly, 1997). By doing this, it would thereby help in the rethink process from the traditional ways of designing educational buildings (Lebon, et al 1991). Similarly, this problem is commonly found in existing Faculty buildings in Nigerian Universities and even as new designs are being developed, they either lack adequate recommendation for such spaces, or are simply ignored by the designers (Nwangu, 2003). This can be seen in the the Nigerian Universities Commission (NUC) standards for Faculty Building design minimum space requirements, where consideration for student recreational was not captured. This consequently brings about the sole aim of this study, which is to assess the level of student satisfaction with provided recreational spaces within Faculty Buildings in Public Universities in North central Nigeria.

Concept of Recreation

The term *"Recreation"* simply means an emotional condition within an individual or human being that flows from a feeling of well-being and satisfaction. It is characterized by feelings of mastery, achievement, exhilaration, acceptance, success, personal worth and pleasure (Rojek, 1995). While, According Hollander, et al (2007) "*Recreation spaces*" are spaces used for refreshment of one's mind or body after work, through activity that amuses, stimulates or play by providing mental relief through the spaces, environment and surroundings provided. Similarly, recreation in general has a positive outlook that is unquantifiable, it is unlimited and endless in our human existence. It does not only improve health and wellness of individuals, but also increases our self-esteem and stress reduction (King et al 2006). The concept of recreation creates a healthy alternative for positive behaviour, which subsequently leads to increase in learning capabilities, productivity and healthy leaving. According to (Fournier, 2008) recreation brings about physical, mental, and social health related benefits which is derived mainly when engaged in recreational activities. Similarly, (Valentine and McKendric 1997) describes recreation as an activity that has great implication on the general wellbeing of individuals. In other words, recreation represent any rational human activity that results in pleasurable response, at any time, place or circumstances with the sole purpose of enriching physical, intellectual and emotional benefits to people. Furthermore, according to the Surgeon General's Report, USA over 60 million people are considered overweight, simply due to lack of recreational activity. The consequences of such overweight leads to diseases like: heart problems, cancer, Type II diabetes, respiratory problems, and psychological problems such as depression and fatigue. However, participating in meaningful recreational activity aides in the prevention of such diseases which will in turn improve the mental and body health of participants. This therefore according to Keuntzel, et al (2008) would enhance personal life through the elimination of depression, increased self-esteem, confidence, reduction of tension and anxiety, and personal growth benefits.

The first known form of leisure space was in Mesopotamia in 2000BC.These were largely manifested in the form of *Arenas* that played many functions such as amphitheatres and plaza, However, the *Acropolis* of Greece and Rome are much better known form of public recreation space and served as important aspect of those respective civilizations (King et al, 2006). Recreation movement in the United States of America began with the establishment of the first playground in the United States to offer recreational opportunity coupled with leadership in 1885, when a large sand pile was placed in the yards of the Children's Mission on Parameter Street in Boston through the efforts of the Massachusetts Emergency and Hygiene Association (Roberts, 1995). This was coined with the desire to better improve the social conditions of children in the community (Larson, et al 1991).

There are two main types of recreational spaces: Passive recreation spaces and Active recreation spaces. (King, et al, 2003). These are spaces that form an integral part of communities, which serves as a location for people to meet, relax and exchange ideas (Fournier, 2010). They are also referred to

as indoor or outdoor purpose-built venues within which recreation facilities are provided (Kelly, 1997). Recreational spaces are basically the open-air space used principally for active or passive recreation use. They are areas for rest, relaxation, learning and appreciation of the built and natural environments, usually enhanced by varying welcoming landscapes (King et al, 2006).

Student Recreation Spaces in Universities

Campus recreation spaces are generally used to describe University recreation spaces. However, the term "Campus" means the grounds and buildings of a university or college (Fournier, 2010). Recreation spaces in universities have its roots in physical education facilities, meant for instruction. (Lebbon, et al, 2002). The major reason campus recreation exist are for the main missions of universities; these missions are simply to render education, learning, and to enhance the quality of student life by preparing people for future endeavours (Babalola, 2007). In addition, comprehensive campus recreation spaces include formal and informal recreational spaces, the spaces for these activities are: intramural sports complexes, fitness centres, sport clubs, outdoor relaxation spaces, aquatics programs and aerobic dance halls (King, et al, 2006). These spaces promote well-being of students, by helping to reduce negative or destructive form of play, extending and enriching academic learning and contributing to other college and university goals (Ellis, 1993). Recreational spaces in universities are characterized by abundance of new and exciting experiences available (Fournier, et al, 2010), These spaces are generally designed with the perception that Campus life can be complex, entertaining, and incredibly rewarding with vastly unique activities that vary from campus to campus (Christorherson, 2002).

A faculty building has several users which could be categorized into staff, students and auxiliary users, the needs of such users usually vary in faculty buildings, and designers usually seek to provide basic solution for these categories of people (Adedayo, 2013). The solution provided is mostly just formal, and this has negatively influenced the comprehensive approach needed for design of such buildings. In other words, faculty building is expected to be designed with proper integration of the Formal and Informal Spaces. This will then carter for the users in general..

Most importantly, faculty building is one academic unit that forms the various components that make up the University. Therefore, all the recreational spaces in the campus are also expected to be used by the faculty users, but there are specific student recreational spaces that are expected to be found in Faculty Buildings. These spaces are in two categories namely; Formal and informal recreation spaces. (King, et al, 2006). The formal student recreational activities include organized sports, other skill-based activities, dance classes, yoga schedules, clubs, groups, and organizations. The spaces can be provided as halls, or classes within the faculty premises (King, et al, 2006). Whereas informal recreation activities are spontaneous in nature, they simply happen as the situation warrants. They include, just seating, chatting, extracurricular hobbies, crafts, leisure games, social activities, and quiet recreation, which involves reading, entertainment, and group discussion. (Lansdale, et al, 2006).

All the highlighted activities form the student recreational spaces needed within a faculty building, and subsequently bring about the need for this study, to assess the level of provision of such spaces in faculties in Nigerian Universities. Since such spaces carter for the student leisure activities within the Academic faculty. Furthermore, Students spend considerable amount of time in the faculty building; some spend over eight hours daily, most of which is done in a sitting position. (Christopher and Odetunde 2002), many tasks are done in a seated position – using laptop, writing, receiving lectures, project defense, seminar presentations and reading. These are some examples of task that are performed daily by students in the faculty. In consideration of the many hours spent in seated position at the faculty. It is important to have suitable breakout spaces that will appropriately provide support for relaxation after performing the regimental tasks of academic learning. According to (Adedayo, et al, 2017) this possibly explains the reason student are found hanging in groups within corridors and concourses of the faculties. These spontaneous leisure activities with no dedicated time and allocated space according to Fournier et al (2010) are therefore expected to be carefully and functionally integrated in the design of Faculties in general. Otherwise, they may suffer fatigue, restlessness and tiredness, simply caused by prolonged sitting in lecture halls. Similarly, when this is done, it would lead to good reduction in muscular disorder and greatly help to increase student's concentration during lecture and possible simplify other related research activities within the faculty in the long run. In addition, to properly organize and study student recreation spaces *"Inclusive Design Concept" is* key. That is, in order to adequately proffer solutions, the rules of Inclusivity for human related design will be used as guiding tool for measuring the provision of student recreations spaces in the faculty (Christopher and Odetunde 2002).

Inclusive Design for student recreational spaces in Faculty building

A key research that address the dynamic needs of students in the 21st centaury is the Next generation learning spaces (NGLS 2008) and Inclusive design. These are processes that results in inclusive environments which can be used by everyone regardless of age, gender or disability (Shipley 2002). It is however an evolving and complex concept becoming a significant theme at the international

discourse, having good influence in educational research. The sole aim of inclusive design is to create an environment that provides for all people and excludes no one (CABE 2011). Nevertheless, new generation learning spaces have brought about some important elements that are now integrated in Academic facilities. These elements include specialized lecture halls, Laptop Bars, Study booths, Open computer labs, Collaborative learning spaces, Service kiosk, Breakout spaces, stations and research faculty hub. All these components also require common transition elements such as sit-outs, lounges, commons rooms, balcony's, faculty Street, and hallways. In addition, the other general spatial elements are green open spaces, outdoor relaxation areas, waiting areas, courtyards, walkways, open terraces, fountains, ornamental gardens, orchards, and formal recreation spaces that involves structured recreation activities such as yoga, dance class halls, and board games (table tennis, chess games, snooker billiard) (Shipley, 2002). These highlighted terms above are spaces that make up a student recreational spaces in faculty according to the NGLS 2008 research.

Space Requirement in Faculty Buildings

The basic design requirements for faculty building in Universities are provided by government regulatory commissions. The commissions are responsible for setting the minimum standards for any form of university either Public or privately funded. The National University commission (NUC), according to (Onwuka, 2015) is solely responsible for the regulation of Nigerian Universities. Table 1.0 shows standard space requirements and guidelines for faculties. The table shows required dimensions in metres square (Sqm) of each space in the faculty building. From the table, it can be seen that general recreation spaces standards were not captured. More so, the specific student recreation spaces. This simply shows that the problem has been created from initial design stage by the regulatory body. Hence the prevailing problems of the lack of student recreation spaces in faculty buildings in Nigerian universities.

Table 1.0. Showing the space s standards for faculty buildings in Nigerian Universities

Space Type	Standard (m2)
Professorial Office	25.0
Head of Department Office	25.0
Senior Lecturers Office	16.0
Other Academic Staff	12.0
Senior Technical Staff	12.0
Junior Technical Staff	12.0
Secretariat Space	16.5
Seminar Room	4.6/person
Drawing Studio (Undergraduate @ 100 students per Studio)	7.5/Person
Drawing Studio (Postgraduate @50 students per Studio)	7.5/Person
Other Departmental Office	0.75/person
Classroom Accommodation	0.75/student

Source: Onwuka 2015

Research Method

Descriptive survey research method was adopted for this study, and quantitative data was generated. A sample frame of 2 faculties each form 7 Public Universities in North central Nigeria was randomly selected. This was achieved with the use of Stratified Sampling Technique. Questionnaire and Observation Schedule was used as research instruments to gather relevant data. The observation schedule was used to obtain general design consideration and features that make up the faculty buildings. While the questionnaire was used to obtain perception of respondents on level of satisfaction with student recreation spaces in their respective faculties under this study. A total of 420 questionnaires were administered to respondents from the randomly selected faculty buildings. The total response rate of 93% was generated. The data obtained was analysed using descriptive statistics and the results was presented in tables, charts and plates. Table 2.0 below shows breakdown of questionnaire administered to respondents for this study.

Table 2.0: Breakdown of Administered Questionnaires

Response	Number of Respondents
Valid Response	**392**
Invalid Response	21
Not returned	7
Very Unsatisfied Students	119
Unsatisfied Students	161
Satisfied Students	68
Very Satisfied Students	40

Source: Author's Field Work (2017)

RESULTS AND DISCUSSION

The discussions of results in this section is generated from analysis of the data collated from field on student satisfaction with existing recreation spaces in the faculty buildings. It can be observed from Table 1.1 above that a valid response rate of 392 was generated from the administration of questionnaire.

Adequacy of student recreational Spaces in faculty

The analysis from Table 3. Shows that all the measured variables that constitute student recreation spaces in a faculty appeared to be very inadequate for the respondents. However, to critically corroborate the data generated form field work, it becomes imperative to examine the level of adequacy of such recreational spaces. That is if they are even provided in the faculty buildings under this study or not. Similarly, in order to provide spaces in any building, the knowledge of the users in relation to the building is important. This will aid in reasonable space allocation so as to achieve a functional building (Gephardt, 2014). This therefore justifies why the analysis should be made on the level of adequacy of available student recreational spaces before making recommendation on how these spaces could be integrated and designed in the faculty buildings. Similarly, Table 3 also shows respondents opinion on adequacy of existing elements that make up the student recreational spaces under this study. The interpretation of the results obtained based on the Likert scale calculation on the range of scale is as follows:

1.0 - 1.49 Very Adequate

1.5 - 2.49 Adequate

2.5 - 3.49 Inadequate

> 3.5 Very Inadequate

In determining the adequacy of the option for each measured variable the weighted score was divided by the number of valid respondents for each section and the value is presented against it as shown in Table 3 below. It can now be observed that all the measured variables in the table are all inadequate based on the interpretations column made hereunder. In order words student recreation spaces were not adequately provided in all the faculty buildings studied. This can be observed in the interpretation from the table below, that all the measured variables are inadequate. However, the level of inadequacy is not generally the same. The adequacy is ranked based on ascending order that shows the inadequacy mean value falling between 2.9 to 3.3. This simply implies that the respondent's perception on the level of inadequacy vary. The provisions of spaces such as outdoor recreational spaces, open greening, and interior relaxation lounges is grossly inadequate with an average rating score of 2.9. However, when this rating of 2.9 is compared to the strongest ranking level of inadequacy which is 3.0 and above from the measure variables shown in table 3, that includes: provision for ICT and viewing centres, protection of spaces from weather, good waste management, and protection of spaces from weather. It then becomes imperative to conclude that students strongly consider viewing centres as highly inadequate and consequently makes it an important requirement to be provided within faculties. Similarly, the outdoor, indoor spaces and seating arrangement has to be protected from harsh weather in order to achieve maximum utilization of such spaces within the faculties. In addition, hygiene (that is good waste management in the spaces) proves to be a key consideration in the spaces for respondent's opinion. Simply, because when these spaces are not kept clean then no one would want to relax in an untidy environment. Other variables such as, outdoor seating areas, landscape features, size and form of the recreational spaces, consideration for people with disability and flexibility of usage of relaxation spaces, also have high values for inadequacy from the interpretation in Table 3. This could be linked to the fact that there was no predetermined design consideration for the student recreation spaces in the initial design stage of the Faculties. See Tables 3, below for further presentation of values on adequacy of student recreational spaces.

Table 3. Respondents' opinion on Adequacy of student recreational spaces in faculties data interpretation

Measured Variables	Valid Response	Sum	Mean	Interpretation
Outdoor Seating Areas within the faculty	392	1152	2.93876	Inadequate
Greening provision in the faculty	392	1153	2.94132	Inadequate
Soft and Hard Landscape provided in the recreational spaces	392	1156	2.94879	Inadequate
Interior provision for formal recreation spaces	392	1164	2.96939	Inadequate
Level of satisfaction with quality of leisure spaces	392	1171	2.98724	Inadequate
Spatial relation between faculty and Student recreation space	392	1178	3.00510	Inadequate

Circulation, Access, safety & Security of Recreational spaces in the faculty	392	1190	3.03571	Inadequate
Flexibility in usage of relaxation spaces	392	1191	3.03827	Inadequate
Seating Arrangement	392	1207	3.07902	Inadequate
Good Waste management in the spaces	392	1219	3.10963	Inadequate
Protection of recreation spaces from weather	392	1221	3.11479	Inadequate
Good consideration for people with disability	392	1221	3.11479	Inadequate
Size and form of recreational Spaces	392	1277	3.25765	Inadequate
Landscape features	392	1294	3.30102	Inadequate
ICT and Viewing Centre provisions	392	1298	3.31122	Inadequate

Perception of student on recreation spaces in faculty buildings

In examining the perception of students on the importance of the student recreation spaces. The measured variables will be given a rating using Likert Scale measurement calculation in the same way it was done for adequacy of student recreational spaces analysis above. This is done in view to determine the most appropriate recreation space required by students that can be recommended for integration in the faculty building. This would also guide in giving the best recommendation for student's recreational spaces to be provided in the faculty based on the results generated. Likert Scale Measurement for rating of perception of student on level of importance for recreational spaces to be provided. The interpretation of the results obtained based on the Likert scale calculation on the range below:

1.0 - 1.49 Very Important

1.5 - 2.49 Important

2.5 - 3.49 Not Important

> 3.5 Very Not Important

In determining the level of importance of each variable: The option for each measured variable was given a weighted score that was divided by the number of valid respondents for each section and the value is presented against it as shown in Table 4. This can be observed that all the measured variables for recreation spaces in the table are considered important in the faculty building design. This is because in all of the faculties studied, student recreational spaces were not properly integrated in the building or are not adequately provided. Variables such relaxation lounges, outdoor sit outs, common rooms, courtyards, opens spaces, inclusive design consideration, reading gardens and orchards has the strongest range of 1.7 to 1.96 level of importance from the interpretation of results in Table 4. Therefore, considered important based on the Likert scale rating score. The main reason here is that majority of the students prefer the outdoor form of informal recreation. Since they are mostly seated in smaller groups, while waiting for lecture schedules and engaging in their respective academic or leisure activities within the faculty. Similarly, measured variables such as: fountains, ornamental pools, aerobics dance halls and Yoga schedules has the lowest level of importance, this can be observed in the interpretation made in Table 4 also.

This is simply because majority of the respondents consider the fountains and ornamental pools as only a landscape feature and does not specifically enhance their relaxation needs or academic activities. In other words, they are considered to be landscape features used to beautify the environment, and they are not spaces for specific student recreation. While the aerobic halls that is mainly a formal form of recreation, the respondents considered it not important with a highest mean score of 2.05. This is because of the level of engagements for academic activities within the faculty, and availability for sports complexes within the campuses because of that students might not necessary have time to change and prepare for the formal recreation pursuit within the faculty, but find it more comfortable to engage in aerobic schedules after lectures hours in sports complex within the campus and out of the faculty. However, all the measured variables here seemed to be very important. This is because most of the faculties under this study do not have a pre-planned design consideration for student recreational spaces integrated in the faculty buildings. This therefore leads to a situation were different concourses, atriums, hallways and corridors within the faculties are spontaneously put into use or converted as recreational spaces by students. See Table 4. Showing respondents' opinion on required / important recreational spaces to be provided in the Faculty buildings.

Table 4. Respondents' opinion on importance of student recreational spaces in faculties data interpretation

Measured Variables	Valid Response	Sum	Mean	Interpretation
Relaxation Lounge/ Sit outs in the faculty	392	662	1.688776	Important

Courtyard provisions	392	701	1.788265	Important
Orchards To be provided	392	705	1.798469	Important
The need for Open Spaces within faculties	392	726	1.852040	Important
Inclusion for Covered Outdoor Seating areas	392	739	1.88520	Important
Reading Gardens	392	764	1.94897	Important
Collaborative spaces (laptop bars & Common rooms)	392	769	1.96173	Important
Fountains and ornamental Pools	392	787	2.00765	Not Important
Aerobic halls (dance & Yoga Classes)	392	804	2.05102	Not Important

Student Satisfaction with existing recreational spaces

Satisfaction level usually vary depending on individual needs, but in this study, the spaces generally provided were inadequate, or even when they are provided they do not suit the needs of students. This consequently can be observed from Figure 2. That Shows 38% of respondents very unsatisfied, and 48% are simply unsatisfied with the student recreation spaces provided in the faculties under this study. This implies that a total of 86% of respondents are unsatisfied with recreational spaces provisions. The reason for such level of un-satisfaction is because in all the sample frame within the study area, specific student recreational spaces were not given good consideration. This can be seen from the analysis generated in tables above that all the measured variables that make student recreation spaces was grossly inadequate and consequently lead the level of unsatisfactory response rate. This means that designing faculty building with good and functional student recreational spaces becomes very important. Taking into consideration the specific student recreational spaces needed by students and their degree of importance. See Figure 2, for further presentation of respondent opinion on level of satisfaction with recreational spaces.

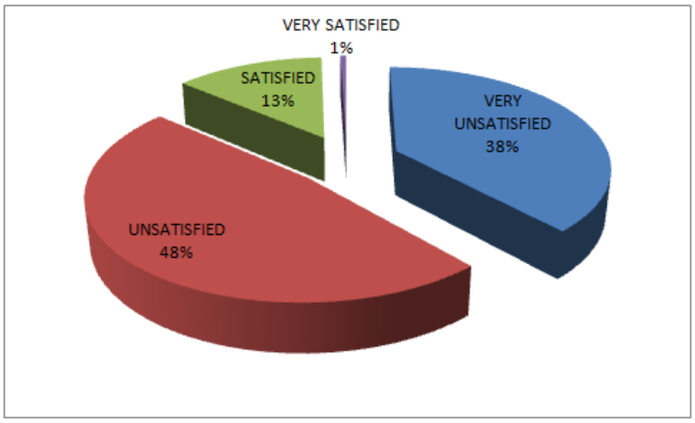

Figure 2: Student perception on recreational spaces

Nature of Student Relaxation Spaces within the faculty

A key factor in the study of relaxation is the space available for an individual to use (Landsdale, 2011). This therefore gives the need to examine the type of leisure spaces provided in the faculty and the number of students that use such facilities, this is a vital tool to be used in determining the adequacy of space for student relaxation needs. In the course of this research majority of the respondents stated that they would prefer outdoor and indoor relaxation space within the faculty to be provided in transit points within the faculty. So, the can easily use when waiting for lectures, Figure 3 and 4 show the nature of relaxation spaces used by students within faculties. It was observed that preference was given to common rooms, viewing centres, Cafes and Corner shops for indoor relaxation. While for outdoor relaxation preferences was given to orchards, reading garden and courtyards.

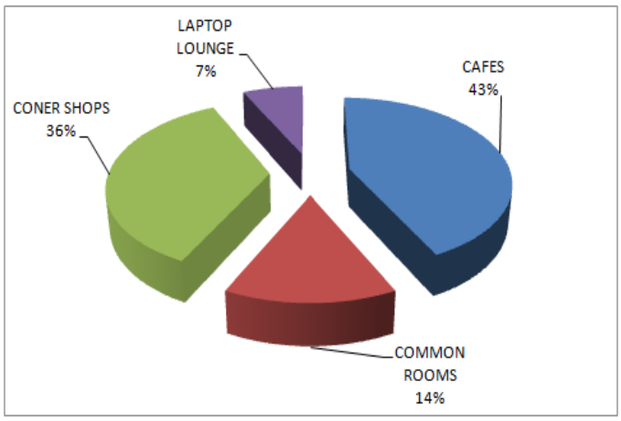

Figure 3: Respondent preferences on nature of student recreational spaces to be used indoors**.**

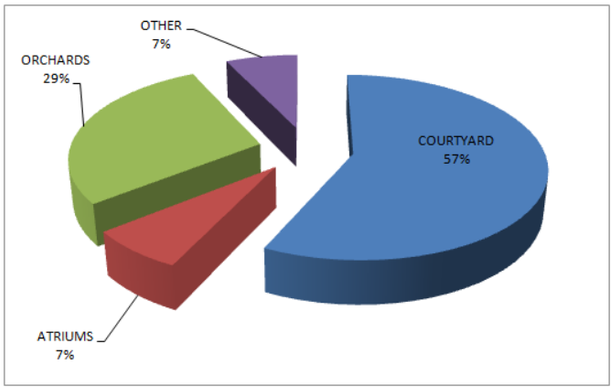

Figure 4.: Respondent preferences on nature of student recreational spaces to be used outdoors.

CONCLUSION

To this end student recreational spaces are essential factor to be considered in any faculty building design. This is owing to the fact that student recreation in faculties are mostly informal and spontaneous in nature and if specific student recreational spaces are not provided, other areas within the faculty would be used as alternative spaces for leisure, but when these spaces are adequately provided, they enhance the student's school experiences, health and social interaction in faculty building and the campus in general. This therefore leads to good concentration on academic learning and productivity. The study also identifies the specific recreational spaces required by students within a faculty and the very high level of un-satisfaction with existing spaces by respondents as well as high level of inadequacy of existing student recreational facilities provided within the faculties under this study. The study also shows that if these problems are not carefully addressed, students are affected negatively in the campus, which they may be engaged in other forms of destructive recreation or relaxation.

RECOMMENDATIONS

The Faculty buildings should be integrated and designed with informal spaces for students to interact. This subsequently means that faculty buildings should be integrated with Specialized lecture halls, Faculty project Hub (this is a space provided as a creative arena for students to engage in their projects, the space is designed based on five key concepts to enhance the students project experience, creativity, interaction, reflection, action and relaxation needs in the faculty), Study pods (this is also an area consisting of a large group with tables, chairs, and computer system, in which a team of students can work in smaller sub groups that will naturally allow them to work informally and cooperatively to solve problems), Reading gardens and Faculty street (This is designed as a hallway similar to the waiting lounges in airports were students wait for their next lectures to begin, to relax and

interact between one another. They are usually placed at transit points within the faculty). This are new ideas that focuses solely on student academic comfort and leisure needs within a faculty building and campus life in general. Other related spaces to be incorporated in the faculty are spaces for collaborative study and informal interaction such as: viewing centres, outdoor sitting area, break out rooms, indoor relaxation lounges, laptops bars and cafes, ICT centres and orchards.

All the recommended spaces are new ideas that focuses mainly on student academic comfort and leisure needs within a faculty building and campus life in general. They are recommended because from the analysis generated all the measured variables appeared to be important to the respondents, and are now recommended as spaces to be integrated in the design of the Faculty building. This would increase the level of satisfaction of students in the faculty building and enhance the relaxation needs of students within the faculty. Since in all our endeavours as human, certainly we must relax and rest for good health, productivity and self-satisfaction. In order words, there is the need to efficiently design faculty buildings with good planning for formal and informal recreation for students. As well as proper integration of the spaces with the main academic activities in the faculty.

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ASSESSING USER PERCEPTION ON THE EFFICIENCY OF PASSIVE SECURITY CONTROL MEASURES IN MODERN PUBLIC SECONDARY SCHOOLS IN MINNA, NIGER STATE

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Passive security control measure is the use of the natural environment to induce crime prevention or make people or a place safe. It can also be referred to as crime prevention through environmental design (CPTED). In order to combat complex issues of crime and fear of crime, many different strategies are needed. A whole range of responses involving strategies in design, community action and law enforcement would be required to achieve successfully the objective of crime prevention. Design considerations such as blast stand-off, chicane, landscape, parking, security lighting, sight line, isolation and entrapment should be put into consideration when designing. Random sampling by balloting was used is the selection of 15 schools out of the 44 public secondary schools in Minna. Observation schedule and questionnaires were used for primary data. From the finding it was observed that medical buildings made use of more security control measures with 62.5%, while commercial and administrative both had 54.1% respectively. Through literature, it was found that certain facilities requires more security considerations than others because they house important properties or people; the status of people occupying such structure and type of security threats. But there is need to improve as passive security is effective is curbing insecurity and also greatly aid the active security (security personnel) by directing traffic towards them for screaming and observation.

Keywords: *Control Measure, Efficiency, Passive Security, School, User Perception*

INTRODUCTION

Nigeria has been faced with security challenges lately, from insurgency in the northeast to kidnapping and the most recent herdsmen attack. The subsequent years from 2009, saw terrorists launching lethal attacks on public structures with the use of explosive devices mainly in the Northern parts of the country. Havoc had been raised on such structures, resulting in loss of lives and properties. The devastation from those attacks point to the upsetting reality that the terrorists are becoming continuously more intricate and audaciously bold in their attacking capacities (Williams & Guttschuss, 2012; Barna, 2014).

According to Joanelly and Schärer (2011), besides terrorist attacks, small scale societal crimes such as robbery, kidnappings, sexual assault and assassination has proven that Security of the public should be of top importance in city development. It is of critical importance to prevent these types of crime in school environments as it concerns public safety.

School security has become a major public concern given the security situation of the country. School design requires a comprehensive security approach to balance different functions such as risk reduction, open access for uses (students, staffs and visitors), proper functional building facilitation, aesthetical principles, strictly obeying building codes and standard beyond required physical structures and make best use of non-structural systems.

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According to Demkin (2014) Security is the state of being protected or safe from harm and can also be the degree of resistance to or protection from harm. The Security and safety of lives and properties should be an integral design consideration for any structure or design. Exterior security system and interior security system are the basic system categories of security and schools design should resolve both comprehensively to discourage attackers. Through crime prevention through environmental design (CPTED) principles, architects can fundamentally manage activities of school security. Controlled circulations within the schools premises can go a long way in enhancing security in schools. Proper zoning of function which will not hinder free movement of users of different categories within the facility and at the same time not compromise security is required. Although it is difficult accomplishing security at the first attempt (Fautsko, Berson, O'neil, and Sheehan, 2013), as this criminals develop ways to bypass this measures hence need for continuous improvement and change of security configurations from time to time. Public buildings of which school is categorized into however can be very safe if CPTED principles are integrated in the design. The paper is aimed at examining the efficiency of passive security control measures in secondary schools to deter against perceived threats to users.

Frequency of Crime in School

Crimes in school have many negative implications on students, school personnel and the community as a whole. These consequences include low student academic achievement, increased dropout rates and teacher turnover. Most of the crimes juveniles or students engage in, on school properties ranges from minor to major and serious offenses.

There was dramatic increase in youth violence in the middle of 1980s to early 1990s; this violence was experienced both in the communities and schools. Homicide rate of teenagers doubled and also non-fatal victimization increased by 20% (Elliott, Beatrice and kirk, 1998). At the stage when killing of other age groups reduced, juvenile homicide was noticed to be increasing at a very alarming rate (Elliott et al., 1998). Non-lethal arrest for juvenile as result of crimes such as sexual assault, assaults and robbery elevated by 38% between 1988 and 1991 (Snyder and Sickmund, 1995). Victimization during this period at school also increased. According to (Elliott et al., 1998) in 1991 56% of youth victimization happened around the schools.

However, more recent data showed the School Crime Supplement to National Crime Victimization Survey indicates that prevalence of crime in school, as well as ferocious crime, has declined considerably over the past decade (DeVoe et al., 2004). The victimization rate of schoolboys and schoolgirls of ages of 12-18 reduced between 1992 and 2002 around the school premises and even outside (DeVoe et al., 2004). The finding was actually true as the rate of crimes in general decreased substantially. Violent victimization rate declined from 48 to 24 crimes per 1,000 pupils and 71 to 26 crimes per 1,000 youths away from the school between 1995 to 2003 (DeVoe et al., 2004).

Building Systems Efficiency

When designing for security which should be of basic concern for any structure, it is important that all the building systems are designed to protect the facility. When there is a threat on the facility, how occupants can be evacuated in the shortest possible time is fundamental. Structural, electrical, mechanical and architectural systems are the systems being discussed. Installation of staircases, elevators, ramps, emergency lighting, place of refuge, and selecting fire resistant material in a building can aid evacuation. The position of exists and signage can also improve the efficiency of these systems. Furthermore, it is important not to give easy access to mechanical and electrical installation such as heaters, air conditions and the electrical panel room(s) because they are susceptible spots for the placement of bombs. The structural systems should be designed to resist immediate collapse for a long period, giving room for evacuation during a blast.

Increase in security challenges in Nigeria

The constant security challenge has led to loss of live and properties and the number of internally displaced persons have increased as well. Bach (2004) said institutional decay in the country can be linked to the insecurity level being experienced at the moment. Nigeria is no longer a peaceful country as once known. It has been plagued with lots of crimes of different magnitude and even terrorist attacks.

Threat Management

International Atomic Energy Agency (2008) defined threat has any hateful act to inflict pain on people or destroy their properties and damage the environment by individuals or groups of individuals. This hateful act includes terrorism of any such (bombs chemical are biological weapons), forceful entry and any criminal offence of any nature. Every threat however has its effective management tool or techniques.

Passive Measure

Passive security control measure is the non-mechanical architectural strategy aimed at preventing crime or make people or a place safe. It can also be referred to as crime prevention through environmental design (CPTED).

Principles of Crime Prevention through Environmental Design (CPTED)

According to Crowe (2000) CPTED is an economical efficient strategy for a safe environment. Safe environment allows a society to develop, improve the economy and also enhance the quality of life. Businesses thrive where there is peace and limited crime, as crime cannot be totally eradicated. CPTED is usually based on environmental design approach devoid of mechanical means used to discourage crimes. There are four principles of CPTED (Queensland Government, 2007). They are:

a) Natural Surveillance

Criminals usually don't want to be seen or observed according to a fundamental proposition. Reprobates are at high risk of been caught when proper surveillance is in place. According to (Hirsch 2004) if the observer is ready to act when threatened, the no-good criminals are even at a greater risk of being apprehended. Surveillance has the ability to keep offenders out but its basic function is to keep them in check and constant observation. There are numerous techniques to achieve natural surveillance. Openings such as window and doors that are transparent, elimination of obstructions to sight line and providing activities that allows flow of people in areas that is deemed vulnerable or at high risk of been attacked.

b) Natural Access Control

Doors and gates are architectural elements used to control access. They keep people who do not have legitimate reason out of a particular place. According to Queensland government (2007) this means is best achieved in areas that requires fewer crowds like a residential building through the use of appropriates locks and provision of burglaries proof for the windows.

However, application of controlled access requires more care in public and semi-public structure. Pedestrian and vehicle entrance used must be properly placed. For natural access it is important to note that the more the entrance into a structure the more it is exposed to attack. Reducing the number of entrance into structure to the best minimum is key to controlled access. This also reduces the number of active security elements required for that structure. Locating the entrance on areas with more traffic can also help to reduce the risk of being attacked.

c) Territory Strengthening

People usually respect other people's territory, same way owners of a territory will protect it with all their might. Stating a clear boundary is very important in achieving territorial strengthening through fences, landscaping element, signs, and pavements there by expressing ownership. These are used to demarcate between public and private properties which is easier to identify unwanted persons on your property. However, with territorial reinforcement, it is easier to identify intruders, as users are familiar with those that are eligible to use the defined space.

d) Maintenance and Management

Areas with dilapidated building are more likely to be habited by criminals or used for criminal activities. Owners of property have to constantly maintain their assets to discourage criminal activities on them. The designers should also use materials that require less maintenance for their design.

It's a known thing that Nigerians have poor maintenance policy especially public property e.g. the National stadium and some national museums are in bad shapes. This is why

maintenance and management has to be considered in the design stage of the project, as this will determine the type of long and short term maintenance culture required for the structure.

Architectural Strategies for Threat Mitigation

Perimeter Setbacks (Blasts Standoff Distance)

Use of explosives has been the main form of attack by terrorist (NCC, 2012). When buildings are close to the perimeter fencing it make it easy for the attacker to drop the bomb close to the fence and the effect of the explosion will harm the users. Bomb explosion can cause outbreak of fire, glass fragments flying and even collapse of the structure. According to NCC (2012) explosive strength is dependent on the type of material used and the quality of the explosive. Blast standoff is a strategic mitigation measure that reduces the effect or degree of damage caused by bombs (Centre for the Protection of National Infrastructure, 2011) as illustrated in figure 2.0 below.

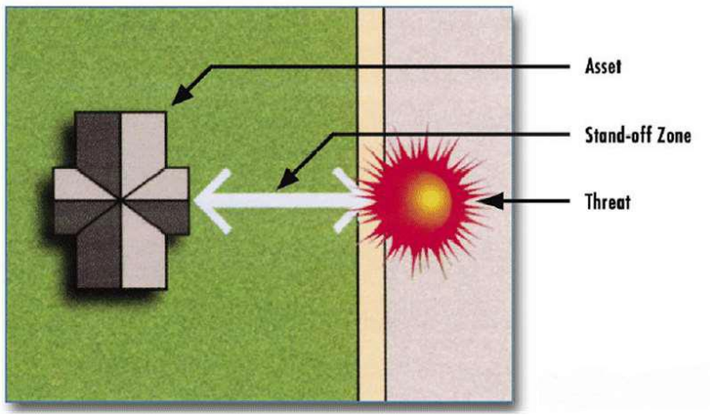

Figure 2.0: Blast Standoff Distance Concept
Source: NCC 2012

According to Maňas et al. (2013), standoff is the distance between detonation point and the building. The minimum distance for public buildings is 15m (50ft) (Demkin, 2008).

Chicane

Chicanes are snake like road design used for limiting speed of vehicles. They are used as hostile vehicle mitigation (HVM) for cars carry explosives. The speed of car can increase the damage done by explosives. During evacuation chicane could be of concern so care should be taken while designing (Forman et al., 2009). Figure 2.2 and 2.3 below shows HVM concepts

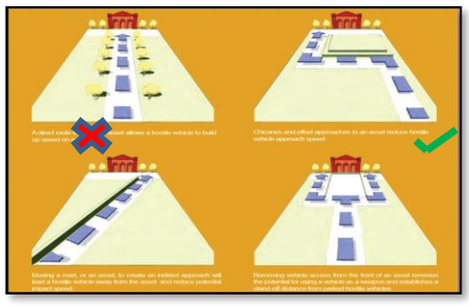

Figure 2.2: Hostile Vehicle Mitigation
Source: Liskay *et al.*, (2014)

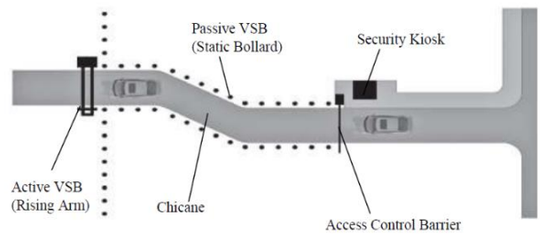

Figure 2.3: Chicane design for HVM
Source: Forman et al., 2009

Landscape

Landscape elements such as trees, shrubs, serves as a good vehicle security barriers (VSB) especially trees with adequate thickness. They are also used to direct movement which leads to areas with natural surveillance thereby reduce the intention of committing crime because in most cases, criminals don't want to be seen or caught while carrying out their act. These landscaping elements include bollards, curbs or raised platform, railings, and planting. Below are plates illustrating use of landscaping elements for security:

Plate I: Pedestrian Walking Between Concrete Planter Barriers
Source: Peart, 2000

Parking Facilities

Parking areas for cars are vulnerable locations for placement of explosives (Witherspoon, 2002) and they should be accorded proper attention during design. Screening of cars before entrance is very important to avoid explosion. Some of the CPTED for parking as highlighted by Smith (1996) are provision of surveillance which in this case should be natural, as that is the only surveillance the designer can provide. Others are proper lighting and controlled access which should be at the entrance point.

The parking should be situated in the blast zone or away from the vulnerable buildings especially for visitors. If the parking is under or close to a protected building, blast resistant barrier should be used to partition the parking and the protected area. Parking for unscreened cars should not be less than 15m away from the closest building while screened cars should not be less than 1.5m (Peart, 2000).

Sight Line

According to (National Crime Prevention Council [NCPC] 2003) the requred line of vision for users is called sightline. People feel much safer when the can see what is happening around them. Their inability to see especially when obstructed by walls, fences, bushes, columns, over grown plants and sharp corners makes them develop fear. This component can also help shield the attacker. To combat this phenomena, low hedges, constant shrun trimming, small tress, chainfence or iron grill fence and flower bed can be used. In addition provision of park bench also helps for natural survellance which will discourage intruders.

Isolation or concealed route

These are routes that can be predictable and pedestrians do not have other alternatives. This does not give the pedestrian the opportunity to escape as the attacker could predict the pedestrian movement once on that path. Examples are underpasses, pedestrian overhead bridges, escalators and staircases. It becomes a major concern when isolated routes ends or terminates in an entrapment area. The design of such areas should be done in such a way it allows for visibility. If there is call for concern on any isolated route, the best solution is modification or removal (Queensland Government 2007).

METHODOLOGY

According to Niger state bureau of statistics 2012, Minna the state capital has 44 secondary schools and 15 were selected through a type of simple random sampling called balloting. This method was used because it offers every participating member equal right to be selected. The samples were picked by my class members in the presence of an external observer. Using variables established from literature such as blast standoff, vehicle access control point (VACP), vehicle security barriers, number of access into the buildings, type of parking, landscape elements present, signage and security lighting. Data were collected through questionnaires and personal observation. General question on security was asked to get respondents knowledge on how to stay safe during terror attack and also how to respond to unfamiliar visitors and scenes. These questions were also asked to know if the schools teach their students and staff on personal safety. The knowledge helped in selecting appropriate security control measures that ensure that users understand it for their own protection.

Minna, the capital of Niger State, having a total population of approximately 506,113 is the study area for the research. The town lies on latitude 60.331E and longitude 90.371N. According to UNDP/NISEPA (2009) the average population density in Minna is about 3448 persons per km2.

Minna has a total number of eleven wards. For the purpose of this research, Nassarawa 'A' ward was chosen because it has the highest number of informal settlements. These areas include: Stadium road, Emir's road, Kuta road, Paida junction, Ogbomosho Street, Central mosque road, Sayako area, Unguwar Sarki, Unguwar Gabas, Sokoto Street.

To assess user perception on the efficiency of passive security control measures in the state, information were gathered from both primary and secondary data. The primary data were obtained through personal observation and questionnaire administration. 750 questionnaires were administered in the ratio of 50 to staffs, students and visitors of each school in the order of: 10, 35 and 5 respectively; out of which only 683 questionnaires were retrieved and valid.

FINDINGS AND DISCUSSION OF RESULT

Assessing user perception on the efficiency of passive security control measures

In order to assess user perception on the efficiency of passive security control, 50 questionnaires were distributed to staff, students and visitors of each school in this order 10, 35 and 5 respectively. These sums to 750 questionnaires, 683 questionnaires were returned which made up 91% of the total as shown in table 4.1;

Personal Demographics

Table 4.1 and Figure 4.1 to 4.4 below show the personal demographics of the respondents.

Table 4.1: Distribution of Questionnaire to Schools

S/N	Category	Valid responses	Invalid responses/ not returned	Total
1	**Staff**	138	12	150
2	**Visitors**	68	7	75
3	**Students**	477	58	525
	Total	**683(91%)**	**77(9%)**	**750**

Source: *Researcher's Fieldwork 2016*

Considering Users' Preference in Making Architectural Strategic decision

Questionnaires were distributed to selected users as identified by users without predispositions. This users are staff (teachers, administrators, securities and supports), students and visitors which included parents. The questionnaires were carefully structured without the use of ambiguous language and were distributed when the school was in section. With the increase in security challenges around the country, getting users opinion is very vital in designing for their safety, because that is the way of getting to know how they put it to use.

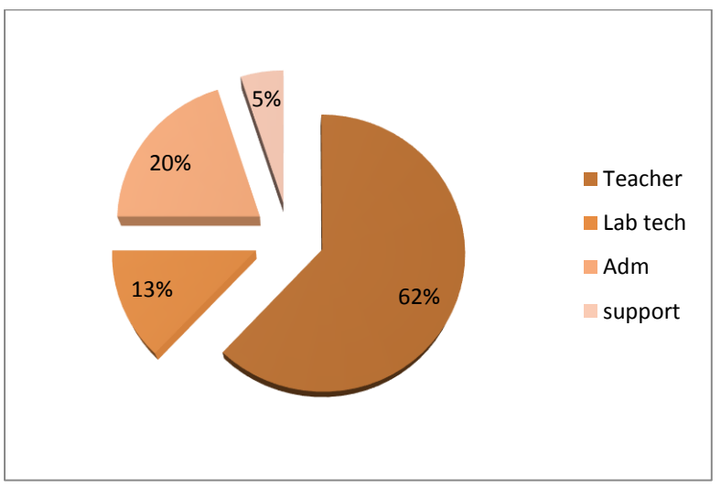

Figure 4.1: Staff Status
Source: *Researcher's Fieldwork 2016*

Figure 4.1 shows the status of the staff in the visited schools. It shows that 5% of the staff made up the support which includes the security.

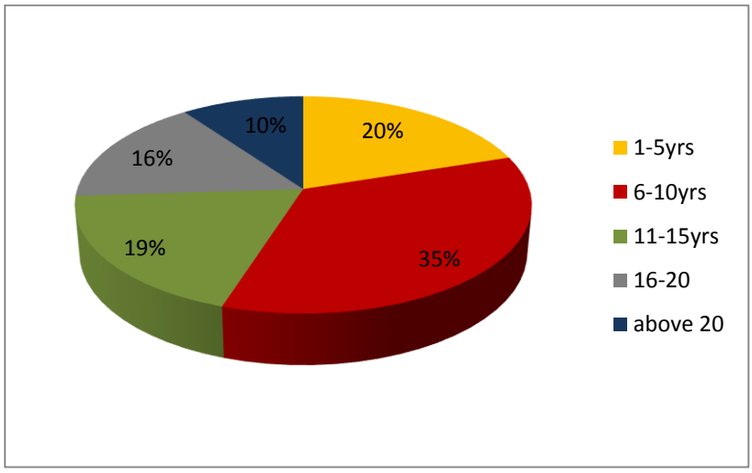

Figure 4.2: working experience in current school
Source: *Researcher's Fieldwork 2016*

The working experience of the staff in Figure 4.2 shows that 80% of the staffs have worked in the current school for 6yrs and above which makes them stand in good position, to provide information for new schools development as they have good knowledge of insecurity peculiar to their various schools.

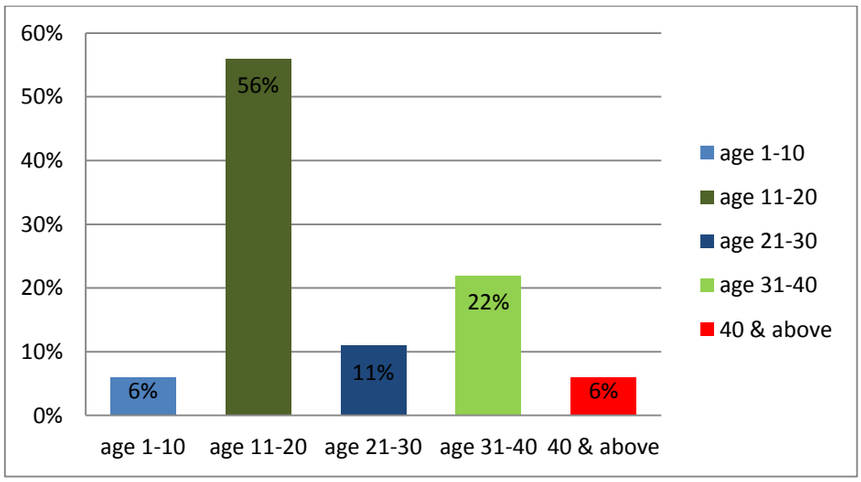

Figure 4.3: Age Distribution of Respondents
Source: *Researcher's Fieldwork 2016*

When designing, it is mandatory to consider all the age ranges involved. As shown in Figure 4.3, the questionnaire captured all age grade, but 56% of the sample size where between ages 11-20 which is the majority of age grade in secondary schools. While 6% were between ages 1-10 and 40 and above. The ages 31-40 consist mainly of staffs and visitors. In the designing for security, everyone's information/contribution is very paramount. Virtually everybody may have experienced one form of crime or the other.

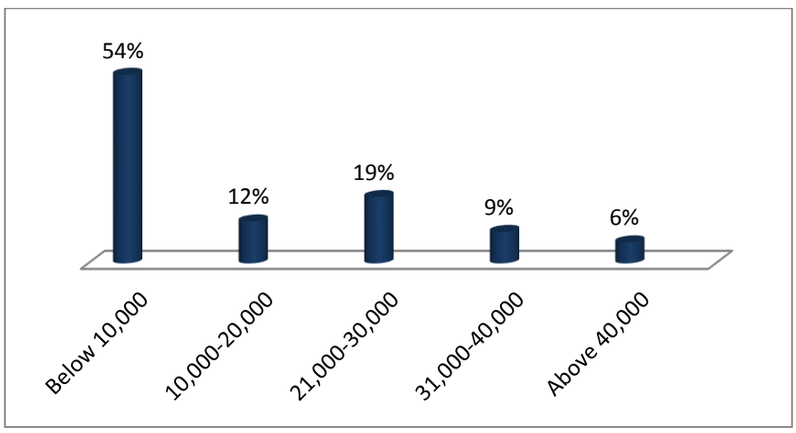

Figure 4.4: Monthly Income in Naira (₦)
Source: *Researcher's Fieldwork 2016*

However, Figure 4.4 shows the income of the respondent. It shows that 66% earn below N20,000 and it gives the notion that this might lure people into committing crime because of money. So in the design of secondary school priority should not be given to anyone especially parking design. The stated standards should be adhered for unscreened vehicles.

General Security Question

Scale: (a) Report to Authority (b) Less Concern (c) Approach the Person (d) Monitor them before raising alarm

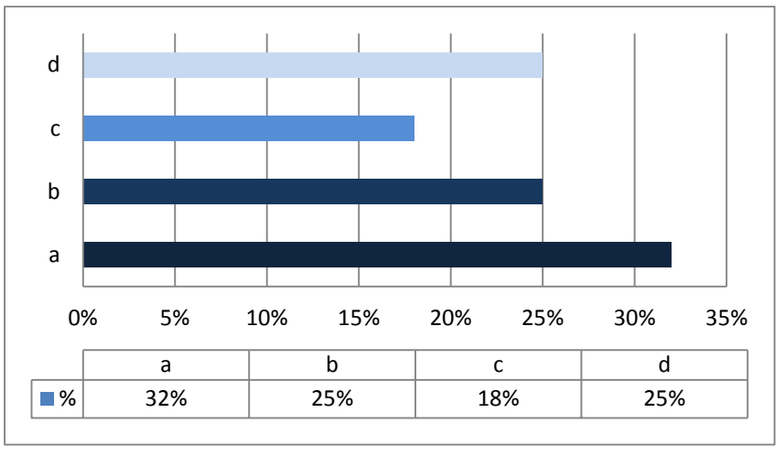

Figure 4.5: Response to Unfamiliar Visitors or Person around the School
Source: *Researcher's Fieldwork 2016*

From Figure 4.5, we tried to know the reaction of respondents to unfamiliar visitors and majority said they would report to an authority which is 32% of the sample but the population of the less concerned was alarming which was 25% of the sample. The design should give the users sense of security; make them aware their safety is paramount to the authorities involved.

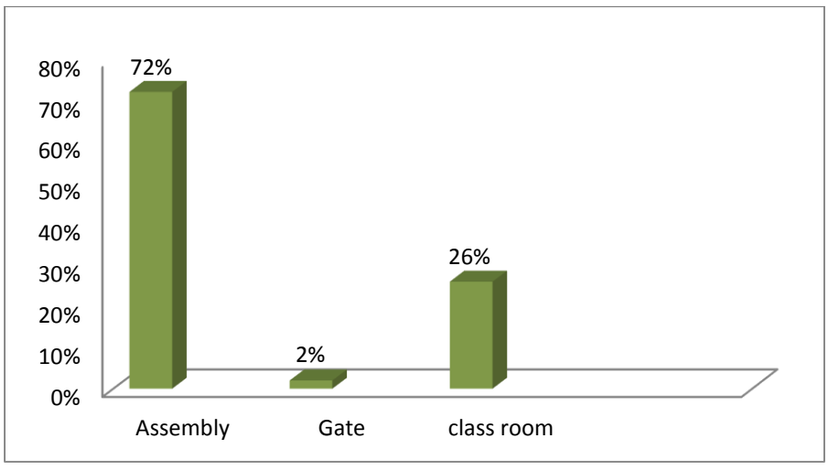

Figure 4.6: Location of Passing Security Information to the Students
Source: *Researcher's Fieldwork 2016*

It was noticed that 72% said that security information is passed in the assembly ground as shown in Figure 4.6. While from literature it was discovered that terror attack usually occurs in gathering such as assembly in schools. It is important to employ another means of passing information to the students other than the assembly ground.

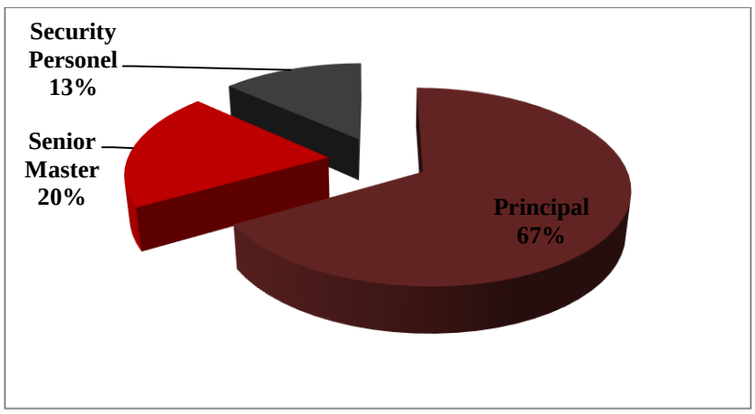

Figure 4.7: Person Responsible To Pass Security Information
Source: *Researcher's Fieldwork 2016*

Furthermore, Figure 4.7 showed that the 67% of the respondent said that the principal is responsible for passing security information, while 20% said it was the senior master in the absence of the principal. Only 13% said it was the security personnel due to the fact that, most of them are untrained and also illiterate.

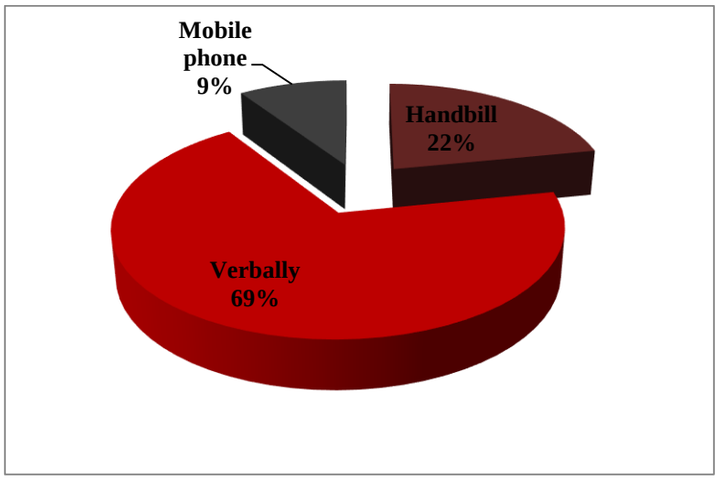

Figure 4.8: Mode of Used To Pass Security Information
Source: *Researcher's Fieldwork 2016*

Questions were asked on the mode of dispersing information and 69% said it was done verbally. This can results to loss of information along the line when being passed to those absent. While, 22% said through handbill and 9% through phones. The use of handbill is one of the best medium, but funding will be the major obstacle to this method.

Respondents Perception of Landscape as Architectural Strategy for Passive Security

Control

Additionally questions were asked about users' perception on landscape, as an architectural strategies for passive security. Table 4.2 shows how they responded.

Table 4.2: Respondents Perception of Landscape for Passive Security Control

S/N	Questions	1	2	3	4	5	Total
1.	Trees are good security barriers for moving cars	8%	15%	27%	30%	20%	100%
2.	Concrete planters can help in control of traffic and public safety	17%	28%	33%	15%	07%	100%
3.	Concrete planters can serve as crash barrier for moving cars	19%	17%	31%	28%	05%	100%
4.	Fence can help in marking territory and avoiding unwanted encroachment	08%	16%	15%	37%	24%	100%
5.	Gates are best used for controlled access	14%	17%	20%	28%	21%	100%
6.	Flowers along walk path can help to control pedestrian traffic	18%	13%	16%	33%	20%	100%
7.	Bollards(short post) can help stop/prevent car ramming attack	17%	13%	25%	33%	12%	100%
8.	Bollards(short post) spacing can affect pedestrians and cars	18%	15%	21%	28%	18%	100%
	Mean Score	**14.9%**	**16.8%**	**24.8%**	**29%**	**14.6%**	**100%**

Source: *Researcher's Fieldwork 2016*
Scale: 1=Strongly Disagree, 2=Disagree, 3=Neutral, 4=Agree, 5=Strongly Disagree

Table 4.2 showed that the mean values of those that agree that landscape element are good architectural strategy for passive are 29%. While 24.8% have neutral view on the use of landscaping elements for passive security in secondary school. 30% think trees are good security barrier but care has to be taken as it could affect sight line which is a very important aspect in design for security. Furthermore, 33% and 31% have neutral view on the use of concrete planters for traffic control and crash barrier for moving car.

Also, 33% of the respondents think planting flowers/shrubs along walkways will help control pedestrian traffic. There is need to monitor movement of people around the school facilities and with this flower along this path users might always take alternative route or create new path which will compromise the security of the school.

Additionally, 33% agreed that Bollards are good in preventing ramming cars, which is one of the means that car bombers use to attack, while 28% think spacing can works as a filter/sieve allowing pedestrian through, while stopping vehicles and motorcycles.

CONCLUSION

Secondary Schools are centre for learning and development of future generation, so they need to be protected. This study has identified challenges public building including schools are faces in terms of security particularly in Minna. The initial designs for schools only paid attention to only the academic aspect neglecting the security inputs as shown by the observation schedule. There was absence of security features on the fence as well as security posts in majority of the schools. This made secondary schools in Minna more vulnerable to attacks.

Recommendation

For secondary school design to achieve optimum passive security control measure the researcher recommends that:

a) There should be only one access point into the school premises
b) Blast standoff distance should be adhered strictly
c) Surface parking should be preferred and setback for unscreened cars should be adhered strictly
d) CPTED concept should inspire the conceptual approach to the overall design.

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ELEMENTS OF ARCHITECTURAL DESIGN AND INTERPRETATION OF BUILDINGS AND MONUMENTS IN KADUNA STATE

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Understanding and interpretation of some features of buildings and monuments at public buildings and utilities is one of the challenges facing end-users and general public particularly the end-users and commuters across the globe. These features shape the final outlook of the buildings and monuments, therefore the end-users and commuters understanding on them should not be ignored at both inception and completion. This is because occupants ought to know how buildings and monuments should look at completion since they will be the end-users. This study assesses elements of architectural design and interpretation of buildings and monuments at public buildings and utilities within Kaduna metropolis which was achieved through; identification and examination of the principles of architectural intellectual appeal, determination of the current level of understanding and interpretation of buildings and monuments by end-users and general public. A total number of 150 questionnaires were distributed to some public buildings and utilities users, commuters and general public within Kaduna metropolis which were asked to demonstrate their understanding on the interpretations of buildings and monuments at public places and utilities within Kaduna metropolis. A total of 81 questionnaires were retrieved representing 54% of valid response rate which were subsequently analyzed using descriptive statistics with the aid of Statistical Package for Social Sciences (SPSS) software. The study found that the level of respondents understanding on the interpretation of buildings and monuments as low. That is attributed to the following reasons as pointed out in the study: difficulty in understanding and interpretation of some building features, lack of putting in place strategies that will ease understanding of building features at project inception. Again, partial and complete neglect of end-users by professionals in some projects has made it difficult for them to understanding and interpret buildings and other structures when completed. Lastly, low level of education of some end-users, commuters and general public on elements of architectural design is responsible for their inability to understanding and interpret buildings and other structures.

Keywords: Intellectual appeal, public buildings, monuments, end-users, commuters, general public.

INTRODUCTION

Buildings and other structures (monuments) are structures that have such architectural or historical significance that have received legal protection. A functional building must comprise the following features: uses distinctive or unusual materials in its construction, was designed by a notable person, was inhabited by a notable person, has a close association with important historical events, is situated within a particular historic environment and is characteristic of a particular area (Art and Humanities Research Council, 2014). Looking at architecture can be one way to assess the date of a building. Particular materials or features went in and out of fashion over the passage of time, which can provide a good clue as to when a building was constructed or modified. It is also the case that some social groups were associated with particular architectural styles (source). Architecture sometimes tell us something very important about the people who lived in or used buildings.

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There are a number of good general guides and resources that can be used to interpret any building or structure which are listed below.

The first step is to consider what strikes you as being distinctive about the building. Are there any features which stand out? Are there any parts of the building in which the architect or builder has shown a little bit of creative flair?

If you are not sure what to look at, then perhaps run through the following questions.

i. What are the walls made out of?
ii. What does the roof look like?
iii. Are there any windows? If so, how many?
iv. What do the window frames look like?
v. Are there any arches? What do they look like?
vi. Are there any columns?

Source: Pevner (2010)

Monuments

A monument is a type of structure that was explicitly designed and built to commemorate a person or event, or which has become important to a social group as a part of their remembrance of historic times or cultural heritage, or as an example of historic Architecture. The monument is often applied to buildings or structures that are considered examples of Architectural and/or cultural heritage. For example Burj Khalifa in Dubai, India Gate, Titanic memorial, Belfast, Pyramid, Egypt, Benin Broze Heads, Ogbunike caves, The Kano city walls and Arometa, Three white cap chiefs (Farlex, 2013).

Cultural Heritage refers to monuments, groups of buildings and sites of heritage value, constituting the historic or built environment. Recording is the capture of information which describes the physical configuration, condition and use of monuments, groups of buildings and sites, at points in time, and it is an essential part of the conservation process.

Records of monuments, groups of buildings and sites may include tangible as well as intangible evidence, and constitute a part of the documentation that can contribute to an understanding of the heritage and its related values. (International Council On Monuments and Sites, 1996)

Based on the foregoing it can be concluded that, understanding and interpretation of buildings and monuments by end-users and commuters in Nigeria still need an immediate attention so as to determine ways to enhance that.

Challenges facing end-users, commuters and general public in understanding and interpretation of buildings and monuments

Understanding and interpretation of buildings and monuments at public places and utilities is one of the challenges facing end-users and other commuters across the globe (Davidson, 2003; Pevner, 2010). And these features shape the final outlook of the buildings and monuments, therefore the end-users and commuters understanding on them should not be ignored at both inception and completion. This is because occupants ought to know how buildings and monuments should look at completion since they will be the end-users. Following that, researches were conducted in some parts of the world in this subject area (International Council On Monuments and Sites, 1996; Art and Humanities Research Council, 2014). However, studies have done little or never investigated the foregoing in Nigeria, particularly within Kaduna metropolis with a view to determining the current level of understanding and interpretation of buildings and monuments by end-users, commuters and general public. To this end, this study assesses elements of architectural design and interpretation of buildings and monuments at public places and utilities within Kaduna metropolis which was achieved through; identification and examination of the principles of Architectural intellectual appeal, determination of the current level of understanding and interpretation of buildings and monuments by users, commuters and general public in Kaduna metropolis.

Research Questions

i. What are the principles of Architectural Intellectual Appeal?
ii. What is the current level of understanding and interpretation of buildings and monuments by end-users, commuters and general public?

LITERATURE REVIEW

Elements of Architectural Design

Over the ages, man has constructed various types of buildings such as palaces, tombs, cottages and places of worships. These buildings reveal many things such as nature of construction, way of life, liking of the people, building materials which were known to them and effects of outsiders who have been invading and ruling the region. To these structures the name Architecture has been given. Architecture has been defined in many ways. Some people have defined Architecture as static and creative art. It may be regarded as the procedure associated with the conception of an idea and its realization in terms of building and Architecture.

Basis for development of Architecture

Fear, love, death and hope have been the basis for the development of Architecture.

Fear: From primitive times the man has been trying to protect himself from attacks of wild animals and rigorous weather.

Love: Instinct of love gave birth to many monumental works.

Death: Death also has been responsible for many Architectural constructions. So many historical tombs are examples of these monuments.

Hope: Pyramids and places of worship have come up out of shear false hopes of the man.

Source: Singh and Singh (2012)

Principles of Architectural Intellectual Appeal

A building right from stage of sketch plan to the stage of its completion needs a programme and organized process. Furthermore, a building is the space organization for utility and is a result of collaboration of various construction materials. The principles of Architectural intellectual appeal are:

i. Unity: This means harmony among elements of building which cannot be split from each other. It is that expedient of composition which give coherence of the parts and integrity of the whole structure
ii. Contrast or Physical appeal: This means absence of monotony. It also deals with creating interest and exhibiting variety. A well conceived contrast of form of size, tone, line and shape may result in multiple divisions of expression and cause serious harm to unity.
iii. Proportion: This is largely a matter of relationship. It is not the actual size but the relative size of one form to another perceivable through comparison which the eye can make between the size, shape, direction and tone of the various elements of composition.
iv. Scale: This means the relation of several parts to one another and to the whole from the aspect of size. Proper scale is not only essential for better result of proportion but it is considered as desirable quality in Architecture and as better means toward unity.
v. Balance: This is the equality of mass about axis of reference. There must be balance about axis of reference. On the basis of proper balance in composition harmony and weighed adjustment of different masses can develop and satisfy viewers with reference to relative importance of the various elements of the design.
vi. Rhythm: This is the essentially a repetition of pattern. Repeating elements may not be spaced at equal intervals. It is more powerful in appealing to human sense than scale
vii. Character or Expression of purpose: This is referred to as a style. This is the culmination of all such principles in building or structure

Features for examining buildings and other structures

This depends on the building, but the following set out some features for understanding and interpretation of buildings and other structure

Doors	Is the door at ground level or raised? Is it flanked by columns, or with a portico above it? Is the door glazed?
Windows	Are the windows glazed? If so, are the panes large or small? Are there shutters? Are the window frames made from wood, plastic or metal? Is the top of the window

	square, rounded or arched? Is the window broken up by any interior features, such as smaller stone arches?
Roof	Is the roof flat, curved or ridge-shaped? Is it of a simple construction, or does it have multiple gables?
Walls	Stone or brick? Or perhaps timber framed? Has plaster been applied to improve the appearance? What is the pattern in the brick work? Is the stone rough or smooth?
Ground plan	Does the ground plan suggest that new additions have been made? Have you compared maps and plans from different dates? Can you think of any reasons why the ground plan is as it is?
External decoration	Are there features on the outside of the building which don't appear to serve any particular structural purpose? Is there plaster which has patterns in it? Or a date plaque? Does the building have a name? Are there any patterns in the brick or stone?

Source: Pevner's Architectural Glossary (2010); Davidson (2003)

Other features that aid understanding and interpretation of buildings

Building materials

It is not just architecture that can tell us something important about the history of buildings. By paying attention to the materials employed in their construction, you may be able to make some important insights into how and why they were built. For instance, imagine that you are studying an old house. Is it built out of stone or brick? Is the roof thatched, tiled or slated? Where did these materials come from? Why did the builders decide to use them? How unusual was their choice? Answering these questions might help to generate some important insights. Examining buildings can tell something about the structures themselves. But it may also permit to gain insights into the surrounding environment. For instance, if a particular type of stone is often used as a building material in an area, then this might offer an important clue about the local geology. Aside the architecture that conveys something important about history, the following are other features that aid understanding and interpretation of buildings and monuments: brick and stone work, brickwork bonds, roof materials, pantiles, glass, metalwork, gravestones, monuments and war memorials. This is because they communicate supplementary information on sole intended purpose of building structures and monuments which cannot be conveyed by mere architecture (Art and Humanities Research Council, 2014).

In general, most of the literature reviewed in this study focus attention on elements of architectural design and interpretation, principles of Architectural intellectual, features for examining buildings and other structures and guidelines that help the understanding and interpretation of buildings and other structures.

Understanding and interpretation of buildings and monuments at public places and utilities is one of the challenges facing end-users, other commuters and general public across the globe. Following that, studies have been carried on elements of Architectural design and interpretation, principles of Architectural intellectual, features for examining buildings and other structures, and guidelines enhancing the understanding and interpretation of buildings and other structures. However, literature has never investigated this challenge facing end-users in Nigeria, particularly within Kaduna metropolis

METHODOLOGY

An extensive literature review was conducted in order to get relevant information on elements of architectural design and interpretation, principles of Architectural intellectual appeal, features for examining buildings and other structures and guidelines that help the understanding and interpretation of buildings and other structures. The principles of Architectural intellectual (i.e. unity, contrast, proportion, scale, balance rhythm and character) were used as basis for structuring questions in the questionnaire. Naom (1998); Enshassi *et al*. (2010) stated that the questionnaire is a widely used approach for descriptive and analytical surveys to find out the facts, opinions and views of respondents. The questionnaire is divided into two parts. Part 'A' contained the respondents' personal information which deals with their status, professions, qualifications and experience. Part 'B' is based on those relevant information that were used to achieve the research aim.

Sample size

The determination of sample size is a common task for many empirical researchers. Inappropriate, inadequate, or excessive sample sizes continue to influence the quality and accuracy of research. A formula for selecting the sample size for a research problem based

on a level of significance and a chosen margin of error was proposed by Cochran (1977) and Levy and Lemeshow (2008). In order to obtain the most efficient, representative sample, for our research, we use the following Cochran's formula for sample size determination.

$$n = \left(\frac{Z_{\alpha/2}}{2\delta} \right)^2$$

Where;
n=Sample size to be determined
$\delta = 0.08$ (The chosen margin of error for the survey)

The value of the standard normal ordinate at $\alpha\%$ level of significance is $Z_{\alpha/2}$. At the 5% level of significance $Z_{\alpha/2} = Z_{0.025} = 1.96$. The sample size is finally determined as follows.

$$n = \left(\frac{Z_{\alpha/2}}{2\delta} \right)^2 = \left(\frac{1.96}{2 \times 0.08} \right)^2 = 150$$

That is, we need a sample size of at least *150* to arrive at a sample with a sampling error of at most 8%.

Stratified Random Sampling

Sometimes, in survey sampling, it may be desirable or even necessary to divide the population into several subpopulations or strata in order to estimate population parameters. In stratified random sampling, the population units are divided into a number of strata. Samples of predetermined sizes are drawn independently from each stratum by simple random sampling.

In this research work, the necessity of stratification is due to administrative convenience, field operations and increase in precision of survey results. Thus for administrative convenience, three categories of respondents: end-users, commuters and general public are treated as a stratum. Then to assess elements of architectural design and interpretation of buildings and monuments at public places and utilities within Kaduna metropolis, we select samples from each stratum. Since a stratified sample consists of units selected separately from each stratum, such a sample is expected to be better representation of the population than a simple random sample selected from the entire population (Levy and Lemeshow, 2008). The following table summarizes the sample size allocation in this stratified random sampling:

Table 3.1: Sample sizes in each stratum

Strata (Type of Respondents)	Sample size
End users	50
Commuters	50
General public	50
Total	150

Sampling strategy

An effective strategy reduced non response, response error and respondents' bias to the barest minimum. In this strategy, the questionnaires not returned or not properly filled are replaced with new ones in order to maintain an *effective sample size* of 150. This is a strategy of minimizing non response. This is because a respondent must respond to all the questions in the questionnaires for his response to be validly analyzed. An *effective sample size* of at least 150 must also be maintained in order to control the sampling variability. In the data collection process, non response could be minimized with adequate follow-up as much as possible. In spite of the follow-up, some non response cases might still be recorded which could only be overcome by extending the sample size sequentially until the desired number of respondents was covered.

Questionnaire

A total of 150 questionnaires were administered to respondents (end-users, commuters and general public) at public buildings and utilities within Kaduna. Some public buildings and utilities within Kaduna metropolis were considered because they serve as platform for easy access to most of the respondents. As it was not possible to cover the whole of Nigeria in the study, the study was restricted to some public buildings and utilities within Kaduna metropolis, Nigeria. Since it is possible to use the most represent able sample size in research (Abdullahi, 2014). Out of the 150 questionnaire distributed, eighty-one (81) were completed

and returned representing 54% valid response rate. Data collected were analyzed using descriptive analytical tool with the aid of Soft Package for Social Sciences (SPSS).

DATA PRESENTATION

Survey on Respondents' Status

The responses from the survey as follows: thirty-seven (37) formed the responses from end-users, twenty-six (26) formed the responses from commuters, and eighteen (18) form responses from general public. The response on the respondents' status in the construction industry can be presented in the following percentages: end-users formed 45.68%, commuters formed 32.09% and general public formed 22.23%

The distribution of data collection by respondents' status shows that there was wider coverage in capturing respondents' views and opinions.

Survey on Respondents' Qualifications

The data collection on respondents' qualification shows that the respondents' with Senior Secondary Examination Certificate forms 20.88%, National Diploma (ND) forms 18.3%, forms Higher National Diploma (HND) forms 17.16%, respondents' with Bachelor of Science (BSc) forms 23.56%, respondents with masters of science (MSc) forms 16.98% and respondents with doctor of philosophy (PhD) forms 3.12%. That shows majority of the respondents' have acceptable minimum qualifications. Based on that, it can be concluded that majority of the respondents are educated. That would further authenticate the reliability and validity of data obtained from the survey.

Survey on Respondents' years of familiarization with buildings/structures

The distribution of data collection by respondents' years of familiarization with buildings/structures shows that respondents' with 5-10years forms 20.33%, 11-15years forms 34.33%, 16-20years forms 25.00% and above 20years forms 20.34%. That has shown majority of the respondents are highly experienced in the construction industry. That has also helped the validity and reliability of data obtained in this study.

The following are some additional comments/ suggestions made by the respondents:

i. Most of the respondents easily interpreted the design concepts of round-abouts.
ii. Monuments are easier to interpret compared to buildings
iii. Designers need to develop strategies that will make easy understanding of building features at project inception.
iv. Partial and complete neglect of end-users by professionals in some projects has made it difficult for them to understand and interpret buildings and other structures when completed.
v. Low level of knowledge of some end-users, commuters and general public on elements of architectural design is responsible for their inability to understand and interpret buildings and other structures.

DATA ANALYSIS

Assessment of weighted means and Standard Deviation (SD) on the current level of understanding and interpretation of buildings and monuments by respondents within Kaduna metropolis

The rating made by respondents on the current level of understanding and interpretation of buildings and monuments are in descending order. The results are as follows: *unity, contrast, proportion, scale, balance rhythm and character*. In general, the results show that the current level of understanding and interpretation of buildings and monuments of Kaduna metropolis as "*low*". This is because most of the ratings on the level of current level of understanding and interpretation of buildings and monuments were made within the range of 2.51-3.23.

The Standard deviation values calculated for these tools/ways are below 1.00: *unity, contrast, proportion, scale, balance rhythm and character*. The low standard deviation values obtained which are below 1.00 for those tools/ways show that the ranking were made clustered around the mean values. That signifies the respondents ranking on those set of tools/ways is consistent. That shows a kind of agreement on the respondents ranking. But

the highest standard deviation values obtained for these tools/ways which are 1.00 and above are; *unity, contrast, proportion, scale, balance rhythm and character* show that the respondents have a disagreement. This is because the overall respondents ranking on the current level of understanding and interpretation of buildings and monuments of Kaduna metropolis as were not made clustered around the mean values.

Table 4.1: Weighted Means and SD on the current level of understanding and interpretation of buildings and monuments within Kaduna metropolis

Tools	Mean	Standard deviation	Rank
Unity	3.23	0.127893	1
Contrast	3.19	0.534110	2
Proportion	3.06	0.109024	3
Scale	2.87	0.412589	4
Balance	2.63	0.890001	5
Rhythm	2.59	1.018845	6
Character	2.51	0.607890	7

Source: Field work 2017

Very High (VH) = (4.5-5), High, (H) = (3.5-4.4), Average (A)= (2.55-3.49), Low(L)=(1.5-2.49), To Low (TL)= (0.00-1.49)

The results show that, the on the current level of understanding and interpretation of buildings and monuments as low. This is because most of ranking on the end-users current level of understanding and interpretation of buildings and monuments of Kaduna metropolis are within the range of 2.55-3.49. The results conform to assertions made by (Davidson, 2003; Pevner, 2010)

CONCLUSIONS

It was found that the current level of understanding and interpretation of buildings and monuments as low. This is attributed to the following reasons as pointed out in the study: difficulty in understanding and interpretation of some building features, lack of putting in place strategies that will ease understanding of building features at project inception. Again, partial and complete neglect of end-users by professionals in some projects has made it difficult for them to understanding and interpret buildings and other structures when completed. Lastly, low level of education of some end-users, commuters and general public is responsible for their inability to understanding and interpret buildings and other structures.

In view of the findings of this research work, there is the need for adequate engagement of end users at project inception stage with a view to educate them on elements that will enhance their understanding and interpretations of buildings.

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ASSESSMENT OF USER CENTERED DESIGN APPROACH IN SCHOOLS OF ARCHITECTURE, NIGERIA

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The study of architecture compared to other course of study, requires certain disciplines which permit for conceptualization and conversion of ideas for acceptance. This results in long working hours, focus, and eye for details. Therefore there is the need to identify the basic need of the students of architecture in their built learning environment that will enhance sustainable learning process. A case study approach was used in the research where five (5) institutions were used and the respondents were randomly selected students. The research implored a quantitative (questionnaire) method of data collection and a sample population of two hundred (200) students, responded to the questionnaire. The data was analyzed using statistical tools such as the mean score and were presented in tables and figures. From the finding Natural/Artificial Lighting ranked first with mean score (MS) of 4.25. Ergonomics which has to do with the designing or arranging the classroom and drawing studios ranked second with MS of 4.14. The research concludes that From the result findings its can be clearly seen that all the seventeen (17) needs of students of Architecture in their built learning environment identified are all of significant importance, with Natural/Artificial Lighting as the most significant and therefore recommends that the management of architectural schools /departments should put into considerations their student needs in the considerations of planning and designing of the their built environment, especially as it concerns Natural/Artificial Lighting, the use of glass materials or other transparent/translucent materials for the passage of light is important.

Keywords: Architecture, Enhancement, Interaction, Isolation, Learning, Perception, Schools, User, Visual

INTRODUCTION

Design of built spaces should be based on the needs of the eventual users for it to be functional and to adequately provide the intended requirements (Preece and Rogers, 2002). Interaction amongst students among other tools of impacting knowledge is very important in every learning environment. What is impacted in the class room is often times generic and subject to further study either individually or through interaction. A learning environment such as a university should incorporate in its architecture by means of design and application of favorable building materials schemes to encourage interaction that foster or encourages learning. Architecture alongside other Art courses involve practices such as drawing, painting, modelling and so on and individual efforts at learning these is often times not enough. Some students are naturally cut-out for learning in such an environment while others have the ability deep down within them and require interaction to bring them out (Jimoh, & Banuso, 2008). Architecture from studies, require a lot of interaction to master its Art and even science. In most universities, bulk of the activities that happen during learning is done in the design studio and workshop. From observation, the interaction amongst students at this level is confined to students of the same level or cadre. Interaction should not be only limited to students in a particular level but should sprout out to students of other levels, higher or lower.

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This confinement or isolation of students that hinder maximum interaction for better learning can be traced to the Architecture of the space. Every user of a built space has a natural response to such an environment (Dudek, 2000). Different behaviors or psychological response of users emanate as they utilize different spaces. This psychological response of students of Architecture in their learning environment should be to want to interact since it has been proven to make learning easier (Heitor, 2005)

Every feature of the Architectural learning built environment should induce responses that make learning easier and more efficient. Features of modern built environment such as Lighting, thermal comfort plays a major role in stirring psychological response to learning. From observation, higher levels of learning centers in Nigeria take a generic approach in both design and adoption of the necessary building materials and rarely take into account the specific needs of the prospective users. This has allowed for after-math approach in forcing the space to work for the users. The approach to learning centers of kindergarten, crèche, Nursery schools, few Primary schools and even fewer secondary take into account the needs of the users so much that when one steps into such environment, a natural feeling of the impact the built environment has on the users is immediately felt. Therefore it is important to assess the need of students of architecture in their built learning environment

LITERATURE REVIEW

Architecture can be defined as the following for better clarity and also in different schools of thoughts.

- Generally speaking, Architecture can be defined as a general term used to describe buildings and physical structures.
- Architecture can be defined more specifically as an Art and Science of designing buildings and executing them in reality.
- The style of design and method of construction of buildings and other physical structures. (Allen, 1880)
- In professional practice, Architecture could mean offering professional services that has to do with design and construction of structures or even an entire built environment.
- The design activity or operations of the architect, from inception or macro-level (urban design, landscape architecture) right up to the micro-level which entails construction details and finishing.

From all the definition given above one can say that Architecture, has to do basically with designing and planning of forms, spaces and living ambient (built up environments) to both reflect functionalism and aesthetics and other technical aspects of construction (Allen 1880). To achieve these, creative maneuverings and putting together of valuable material and technology must come into play. Very often, there is usually a conflict between the different requirements and this must be resolved to adequately produce and Architectural Edifice. Architecture in its practice also involves aspects that are pragmatic in nature to achieve its set goals, some of which are; cost estimation, Building Administration and building material scheduling. The structure/Physical construction is the usually defined by documentation by the Architect such as Plans, Structural details and so on. Architecture as a word has also been adopted to be used in other fields such as information Technology to mean the same thing except in this case, designing and construction are virtual.

Theory of Architecture

One of the oldest surviving works on Architecture is called "De Architectura". It was authored by a Roman Architect called Vitruvius in the very early 1st Century A.D (Howe, et al. 2008). According to the thoughts of his works, every good building must out of necessity satisfy these three principles of "FIRMITAS, UTILATAS AND VENUSTAS" Which means Firmness, commodity and delight in direct translation. In modern English though, they mean.

1. Durability: Every Building must be robustly upright
2. Beauty: A building should be physically appealing
3. Utility: A building must be functional for what it was intended for.

Conceptualizing a learning environment

The idea behind this concept is nothing order than providing with learners an environment that assists their quest to learn. The "learning environment" should be center for lifelong learning. A learning center should at a glance represent the kind of learning done in it. The OECD (2009) defines an educational space as a physical space that allows a variety of teaching and learning programmes. It is one that demonstrates from its physical appearance the kind of learning don there. Going by that definition, it can be concluded that a learning environment that doesn't have a special touch to it that portrays the kind of activity that goes on it is incomplete (Wolff, 2002).

The concept of the physical learning environment that relates to physical structures has a lot to do with spaces, instruments/equipment and tools within the learning center. Lehtinen (1997) proposed that this concept of learning spaces has evolved into an even more complex structure that includes teaching aids such as equipment, sources of information and events outside of center, where participants have the freedom to involve themselves in the learning process either directly or virtually. The introduction of the Internet alone has contributed immensely to the significant changes seen in schools today (Sanoff, 2001).

According to Lackney, (2001), the quality criteria for school building and design, the key actors are students; requirements are determined by

1. Specific age
2. Nature of school
3. Needs of the society
4. Needs of the students (Psychological and social)
5. Societal and environmental influences (Psychological and social)

Learning at higher cadre such as undergraduate and post-graduate learning environments deviate more and more from the conventional classroom setting and more into isolated but guided learning (Fisher, 2005). It is due to this that the environment for learning at this level should incorporate in every way, interaction and visual enhancing aids that the environment of learning alone can provide. Architecture alongside other courses of study that require visual stimulation to actualize one's desired idea should be learnt in an environment that sponsors such (Lackney, 2001).

Architectural Education

Architectural education is one of the most unique branches of science and art related education that requires a lot of creative ability, whether naturally gotten or influenced. Architecture students are trained to be extremely analytical and imaginative. Architecture is both a mixture of science and Art. The scientific aspect requires one to be able to proffer solutions to the wide variety of clients or potential client's preference as it regards built up spaces while the Art side of it requires the Architect to represent this scientific solution in a manner that captures the fancy. This is the reason why the requirements for admission for Architecture is a mixture of science and Art courses. The training of Architects in most institutions is a very rigorous one that saps the student both physically and mentally thereby equipping them for the challenges of the real world. After obtaining the first degree, it is still not enough grounds to practice Architecture full-fledged. There are regulatory bodies and trade unions that set the standard for anyone intending to practice Architecture. In Nigeria, ARCON (Architect's Registration council of Nigeria) is the body recognized by the government to regulate and set examinations for intending Architects. The trade union of Architects is called (NIA- Nigeria Institute of Architects) as earlier mentioned, this body is merely a trade union and cannot sanction defective Architects but only set in place to protect the common interest of practicing and prospective Architects.

Architectural student Interaction in the Built Environment

The psychological response of being in a learning environment should vary from being in any other environment (Moon, 2006). A learning environment should induce readiness to learn even when it is not there initially. A lot of carefulness must be given to design of these learning spaces especially for unique cases such as architectural students, where there is so much emphasis on precision and accuracy of work. Consultants ranging from academicians to psychologists should be brought on board to assist in achieving an environment that

encourages or fosters learning. Studies show that more efforts have been put into this endeavor of creating an environment that induces readiness to learn in formative learning environments more than higher learning. Crèche, kindergarten, most Nursery school, few secondary schools and fewer tertiary learning environments have adopted this approach. More care is given to the conceptualizing the learning environment for formative learners than higher learners which should not be. According to Norman and Draper (2004) it is worthy of note that visual enchantment is important for students in a tertiary learning environment. However other considerations for architectural student needs in the Built Environment as seen by other authors (Roberta, 2005, Routledge et, al 2012 and Peter, 2013) are:

1. Space adequacy
2. Separate lecture rooms
3. Separate cad studio
4. Enough convenient space
5. Drawing storage space
6. Workshop spaces
7. Learning Comfort
8. Natural/Artificial Lighting
9. Natural/Artificial Ventilation
10. Outdoor and indoor relaxation
11. User Needs Variables
12. Human Factor
13. Design
14. Ergonomics
15. Accessibility of functions
16. utility
17. Variables Assessment Criteria

RESEARCH METHODOLOGY

This study employed the grounded theory and interpretive ethnography to identify and describe students' perceptions of their learning spaces. The advantage of the grounded theory approach in this regard is that because the theory is drawn from data, it is more likely to offer insight and enhance understanding, and provide a meaningful guide to action. (Groat & Wang 2002). An ethnographic approach was also employed as it is intended to capture and understand lived experiences. (Denzin, 1997)

Sources of Data Collection

Data analyzed in this research was obtained from primary and secondary data sources. The quantitative methods of data collection and analysis were employed systematically, in order to provide answers to the research questions. The quantitative research method was adopted in this research to ascertain some underlining questions as to the student needs in the Built Environment. It was very helpful in understanding the problem and how to develop constructive ides in solving them. The quantitative research method was also used to statically and numerically understand the data and achieving mathematical solutions. The two methods were therefore necessary to both obtain the opinions of the persons being researched on and gain statistical numerical data necessary for this research (Kronengburg, 2007).

Population

The survey consisted majorly of two (2) stages. The first involved compiling a list relevant institution to this research. The preliminary survey gave room and informed the need for which institution will give the desired data to be gathered. The population of the study is students of architecture in the following institutions.

Table 1 **Local Case studies visited by researcher**

S/No.	Institution and Location	Population
1.	Department Of Architecture, Federal University Of Technology, Minna, Niger State.	286
2.	Department Of Architecture, Ahmadu Bello University, Zaria, Kaduna State.	334
3.	Department Of Technology, Covenant University, Ota, Ogun State	157
4.	Department Of Architecture, Kaduna State University, Kafanchan, Kaduna.	96
5.	Department Of Architecture, Kaduna Polytechnic, Barnawa, Kaduna.	135
	Total	**1008**

Source: Researcher's Field work, 2016

Sample Population

The following equations were used to define the appropriate sample size from its order to make findings that are applicable to the entire population as advanced by (Kapoor, 2010).

$n = no / [(1 + no / N)]$……. (1)
$no = (p*q) / v^2$……...(2)
Where;
no = Sample size from a finite population
p = Proportion of the characteristics being measured in the target population
q= complement of *p*, i.e. 1-*p*
V = maximum standard error allowed
N = population size
n = sample size

To maximize the sample size *n*, the value of *p* was set at 0.5 and *q* at 1- 0.5; the target population *N* is 1008; maximum standard error *V* was set at 5% or 0.05. Substituting the values into equations 1 and 2 above, the minimum required sample computed for the research is two hundred and six (206) respondents.

Method of Data Analysis

When the entire survey questionnaires were collected, the research used statistics to analyze all the data using the percentage to determine the magnitude of the responses to the questionnaire.

Tables, means, percentages and chart were used to express the statistical result concerning the demographic data of the respondent.

$$\textbf{Mean Score} = \frac{TS}{N} \quad (3)$$

Where,
TS = is the total weight given to each attributes by the respondents.
N = is the total number or respondents in the sample.

Ranking of the items under consideration was based on their Mean Score, as any mean equal to or above 3.0 is considered significant.

DATA PRESENTATION, ANALYSIS AND RESULTS

The demographic data collected indicated that, 206 questionnaires were administered to the architectural students of the study areas. Table 2 represents the number of questionnaires administered to the students. A total of 200 questionnaires was properly filled and retrieved forming a percentage of 97.1

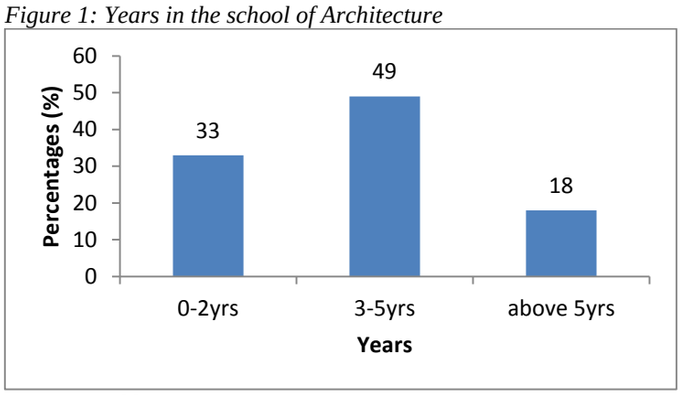
Table 2: Demographic Data of the Respondent

Administered	**206**	**Percentage (%)**
Returned	200	97.1
Not Returned	6	2.9
Total	**206**	**100**

Source: Field Survey, (2016)

Figure 1 shows the number of years the respondents have been a student in the school of architecture. This is relevant to their level of knowledge of the activities and involvement in the school of architecture. 49% of the respondents have been in the school for about 3 to 5 years, 33% have been in the school for 0 to 2 years, while 18% have above 5 years stay in the school. Therefore from the data it is indicative that the students have considerable number of years in the school to enable them respond adequately to the questionnaire.

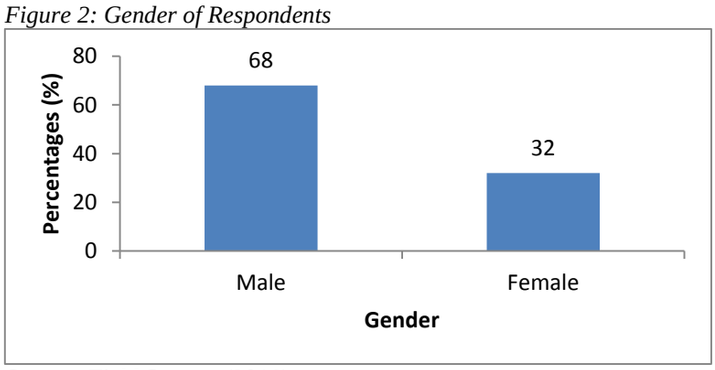
Figure 1: Years in the school of Architecture



Source: Field Survey, (2016)

It is important to identify the gender of the respondents, since each of the gender responds differently to situations, due to physiological and psychological orientation that exist in them. 68% percent of the respondents are male, while 32% of the respondents are female. This further goes to show that male students are more populated in the schools of architecture.

Figure 2: Gender of Respondents



Source: Field Survey, (2016)

Needs of Students of Architecture in Their Built Learning Environment

Table 3 shows the Needs of Students of Architecture in Their Built Learning Environment. A number of needs were identified from the review of a several literatures; this constituted the items in table 3. The items were ranked on the basis of their importance as seen. Natural/Artificial Lighting ranked first with mean score (MS) of 4.25. Ergonomics which

has to do with the designing or arranging the classroom and drawing studios ranked second with MS of 4.14. Workshop spaces ranked third (3rd), Natural/Artificial Ventilation and Learning Comfort both ranked fourth (4th) with MS of 4.03. Space adequacy ranked sixth (6th), with MS of 4.02. Separate lecture rooms ranked seventh (7th) with MS of 3.94. Variables Assessment Criteria and Outdoor and indoor relaxation both ranked least (16th) with MS of 3.68.

From the result findings its can be clearly seen that all the seventeen (17) needs of students of Architecture in their built learning environment identified are all of significant importance, with Natural/Artificial Lighting as the most significant. This can be attributed to the key activity of architectural students, which is designing.

Table 3: Architecture Students Need

s/n	Need	Frequency of Response					N	TS	MS	Rank
		5	4	3	2	1				
1	Space adequacy	76	72	32	20	0	200	804	4.02	6th
2	Separate lecture rooms	64	80	36	20	0	200	788	3.94	7th
3	Separate cad studio	60	76	36	24	4	200	764	3.82	10th
4	Enough convenient space	52	92	36	20	0	200	776	3.88	8th
5	Drawing storage space	40	92	64	4	0	200	768	3.84	9th
6	Workshop spaces	56	96	48	0	0	200	808	4.04	3rd
7	Learning Comfort	84	64	34	10	8	200	806	4.03	4th
8	Natural/Artificial Lighting	92	84	10	10	4	200	850	4.25	1st
9	Natural/Artificial Ventilation	72	72	46	10	0	200	806	4.03	4th
10	Outdoor and indoor relaxation	32	104	32	32	0	200	736	3.68	16th
11	User Needs Variables	44	92	32	32	0	200	748	3.74	13th
12	Human Factor	48	92	32	28	0	200	760	3.8	11th
13	Design	56	84	28	28	4	200	760	3.8	11th
14	Ergonomics	108	44	16	32	0	200	828	4.14	2nd
15	Accessibility of functions	44	80	52	20	4	200	740	3.7	14th
16	Utility	44	88	40	18	10	200	738	3.69	15th
17	Variables Assessment Criteria	40	84	48	28	0	200	736	3.68	16th

Where 5=very important, 4=important, 3=neutral, 2=unimportant, 1=very unimportant
Source: Field Survey, (2016)

CONCLUSION AND RECOMMENDATION

The research identified that the students of Architecture in their built learning environment have certain basic needs that will aid in their learning process. These basic needs identified were classified into seventeen, with Natural/Artificial Lighting as the most significant. Therefore the research recommends that deans, heads of departments and the management of architectural schools /departments should put into considerations their student needs in the considerations of planning and designing of the their built environment, especially as it concerns Natural/Artificial Lighting, the use of glass materials or other transparent/translucent materials for the passage of light is important. There should be the use of ergonomically acceptable chairs and tables to avoid health related issues as a result of long duration of working.

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ASSESSMENT OF DESIGN FEATURES FOR CIRCULATION IN GENERAL HOSPITALS IN KOGI STATE, NIGERIA

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The blood of a building is the people who use it, hence in other to keep the building alive, the blood must move round unimpeded. The way through which people move in and around a building is referred to as circulation and the features of a building that facilitates this smooth movement are the component of the circulation system. Therefore the functionality of a building with various complex inter-related functions as a hospital depends greatly on its circulation system. This research seeks to carry out an in-depth study of the circulation system of the hospital as well as the design features that enables unobstructed movement of people. The method used in this research is the descriptive survey method and data were obtained from the field with the aid of a checklist and interview of relevant persons. The study brought to light the fact that there are some salient circulation issues not addressed in hospitals design for avoidance of unwanted traffic situations. This research was concluded with recommendation of integration of signage, name plates to aid wayfinding, designation of routes for vehicular and pedestrian circulation as well as use of doors that are made with see through materials or with provision for a see through.

Keywords: Circulation, Hospital, Traffic, Design Features, Inter-Related Functions.

INTRODUCTION

Building circulation refers to all the elements that enable users including those with disabilities to move through the building (Chung, 2012). The importance of a properly designed circulation system is such that it enables a clear way finding, enhances identification of entrances by users, eases the movement of people from floor to floor and eventually find their way with minimal effort. Idoko (2014) stated in his research that the way individuals perceive the degree of respect or freedom they have in any place is to a great extent affected by the circulation system of such a place. Circulation components are without doubt the most viewed and used space within any building and therefore requires materials with exceptional durability. Hence the overall impression of a building lies largely with the visual character of the circulation components (Chung, 2012).

In architecture, circulation is usually applied to mean the movement of people and goods between interior spaces in buildings and entrances and exits (Idoko, 2014). Essential for every building is convenient, rapid and safe circulation in both normal and emergency situations. Sohpie (2016) described the concept of circulation in architecture as indifferent from the meaning of circulation learnt in science classes as the movement of blood around the human body. In the case of buildings, people are the blood which must move through the entire building in other to keep the building alive.

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Masoumeh (2013) stated that provision of proper circulation for hospital is a normal design process in order to move people easily and efficiently from one space/area to another without feeling lost. This is because a productivity-oriented circulation system will need to improve staff performance; enhance patients' safety, privacy and rate of recovery; minimize the risk of cross-infection; reduce the delay time of external service delivery; create a more welcoming environment for visitors; and reduce the evacuation time in emergency situations. A hospital is a complex system of interrelated functions requiring constant movement of people and goods, hence needs a very good and efficient circulation system.

Meaning of Hospital

Hospital first came into being before 1000 B.C (Joshi & Mamta, 2000). The word had different meaning and application from one place to another. During the middle ages, as indicated by Chandra (2007), the hospital had served purposes such as alms-house for the poor or hostel for pilgrims.

The modern concept of the hospital as cited by Idoko (2014) describes the hospital as an institution built, staffed and quipped for the identification and diagnosis of diseases and treatment whether medical or surgical, of the sick and injured. It also caters for their housing check during this process and for certain other procedures, such as examination and management of child birth; that are ordinarily directed more to the preservation of health and physical well-being than to the cure of diseases on of physical or mental abnormality. Thus, the hospital is a specialized body where the patient care is of foremost importance and around which all activities of the hospital revolve.

From the organizational and administrative point of view, a hospital is almost but not quite like a city within a city. The hospital is constituted by an operation theatre, the patients room functioning as a hospital, a dormitory for student nurses, residents and interns, a school for training of nurses, technicians, dietician, laboratories and a pharmacy, food vending operations. It also contains laundry and linen service, delivery service, a post office, massive internal and external communication system, blood bank, accounting and credit services, a public relation department, a motor service, and security patrols (Mohammed-Akbar, 1999). It suffices to refer to the hospital as a health care organization.

Circulation in Architecture

In making provision for circulation systems in places where large number of persons are expected, the basic principle is to ensure that spaces are oriented in such a way that they can be identified and accessed with ease by users (Steve, 2008). According to Sohpie (2016), in the design of circulation system there are rules that are applied, these rules are known as 'rules of thumbs', which states that circulation routes should;

- be clear and unobstructed and
- follow the shortest distance between two points.

Obviously the fact that it is innate for people to always want to be able to move around a building with ease and efficiency and without the feeling of being lost is the reason for the two rules of thumb above.

A key factor to be considered in circulation system design is the security of its users, which is why they are designed to be free from trip hazards, fire resistant and anti-slip surface (Capenter, 2006). Ideally, conveyance of people is the basic function of circulation systems, but this trend has changed as the overall impression of a building lies largely with the visual character of the circulation components (Chung, 2012) (Geraint, 2007). Harmon (2011) noted that architecture is not a static experience, circulation routes which are ways to enter, go through and go around a building help people to understand the architecture as they move through the building and its spaces. Circulation elements such as corridors, lobbies, entrances/exits, ramps, elevators, escalators and staircases are used to optimize the flow of individuals through the building (Bastian, 2010).

Classification of Circulation

Vertical Circulation

Vertical circulation refers to the way people and freights move up and down within a building, so includes things like stairs, lifts, ramps, ladders and escalators which enables users to move from one level to another (Sohpie, 2016). The successful functioning of a multi-storey building design is dependent upon the vertical circulation of traffic both in

normal use and in emergencies (Steven & Allen, 2004). Traffic moves from level to level in a multi-storey building by ramps, stairs, elevators, or escalators. The powered systems are always supplemented by stairs for use when power is out, or there is a mechanical failure, or maintenance work is in progress, or in emergencies.

Horizontal Circulation

In accordance with Centre for Excellence in Universal Design (CEUD) (2011), **horizontal circulation** is the movement through a horizontal dimension its **design determines** the character of the whole building. Horizontal circulation systems puts into consideration; the building requirement and appropriate size related to its uses, it ensures that the circulation plan works in both directions, indicates expression of traffic convergences especially in the design for fast exits and changes in levels must be clearly expressed.

Horizontal circulation elements include hallways, atria, paths, entries and exits. Furniture layout is also a critical consideration as well as other objects in the space such as columns, trees, or topographic changes. Architects usually use furniture as part of a concept of design because it is critically linked to the flow, function and feeling of the space (Sohpie, 2016).

Circulation in Hospital

Hospital circulation systems are critical not only to provide clear and intuitive way finding for families and patients and to accommodate the many staff members and services, but also for infection control, carefully designed to separate and control public and private, clean and soiled traffic types. Planning is made more complex by the many functions which need specific adjacencies and short travel distances, while at the same time controlling and directing traffic flow. In planning the hospital, a logical and simple horizontal and vertical circulation system is the essential framework for more detailed planning (Kundrs, 2004).

Maria, Nicoletta, & Sabrina (2013) states that; "circulation in hospital refers to the flow of information, people and equipment in hospital complexes". In particular, the issue of flow management has several applications in healthcare building which include: spatial proximity relationships among different functional sectors, circulation hierarchy, path differentiation, and the transportation of equipment, the legibility of access, journey times and entrance control.

Netherlands Board for Hospital Facilities, (2002) also stated that the basic quality requirements describe the minimum requisite level of quality with which certain facilities or accommodation must comply in terms of functionality, safety and hygiene. These basic quality requirements are: reachability, access, flexibility (internal and external) and spatial relationships.

Architectural Concepts of Circulation in Hospitals

From the Netherlands board for hospital facilities [NBHF] (2002), concepts such as flexibility, functional relationships and design have been translated into the building structure of the hospital. The models are:

- **Breitfuss Model:** A typical feature of the Breitfuss model is that a tall building block with nursing functions is placed above a flat building block with treatment and outpatient functions.
- Double Comb Structure: The double comb structure is characterized by a traffic zone in the center from which different building wings protrude like the teeth of a comb.

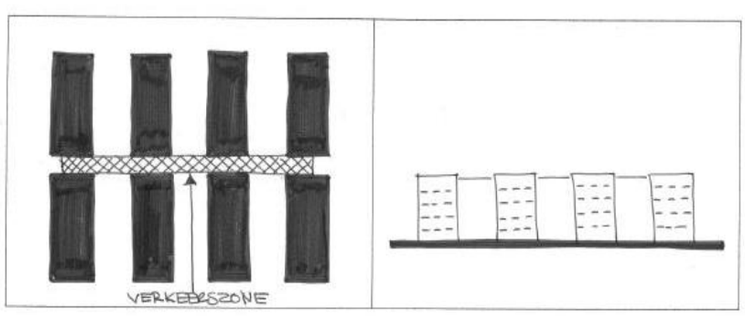

Figure 1.0: The double comb structure
Source: Netherlands Board for Hospital Facilities, (2002).

- Arcade Structure: In this model, the building elements of the hospital are linked with each other by a glass-covered arcade for main traffic.
- Cross Structure: In the case of this model, two building blocks each in the form of a cross have been linked to each other so as to create a large covered hall between the two building blocks. The covered hall is the center of the building and contains the central facilities.
- **Branched structure:** Here the most characteristic element of the hospital structure is formed by the number of branches and open ends. The main entrance is directly linked to the central hall.

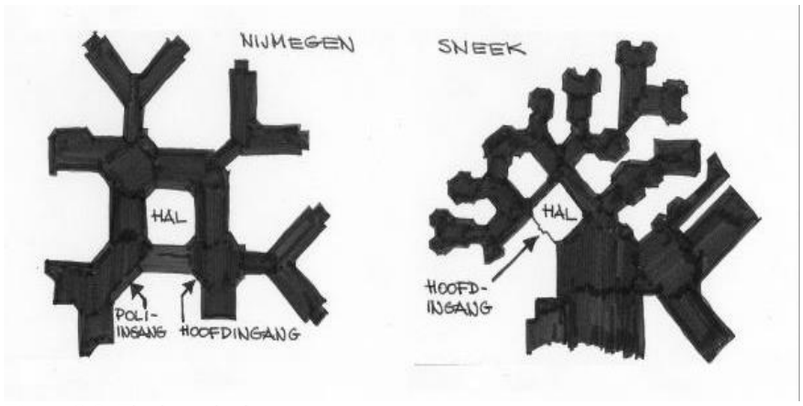

Figure 2.0: The branched structure
Source: Netherlands Board for Hospital Facilities, (2002).

- Linear And Pavellion Structure

RESEARCH METHODOLOGY

The descriptive survey approach method of research was adopted in the conduct of this research. This approach was used because it utilizes elements of both quantitative and qualitative methodologies as appropriate. This method employed the use of well-structured observation schedule, unplanned oral interview and literature to collect relevant data.

The study area is Kogi state which is located in the north central region of Nigeria and it has 21 local government areas. The population of study for this research is made up of all the government owned general hospitals in Kogi state at as the time of this research. Information made available by the Kogi State Hospital Management Board puts the number of hospitals at 20 general hospitals. Using simple random sampling technique, a minimum of 3 hospitals were selected from each of the three senatorial district of the state bring the sample size to 13 general hospital.

Table 1.0: General Hospitals Studied

Name of Hospital
Federal Medical Centre Lokoja
Zonal Hospital Anpka
Zonal Hospital Dekina
Zonal Hospital Idah
Zonal Hospital Okene
Zonal Hospital Kabba
General Hospital Ugwolawo
General Hospital Iyale
General Hospital Koton-Karfe
General Hospital Isanlu
General Hospital Mopa
General Hospital Ogori
General Hospital Okengwe

RESULTS AND DISCUSSION

The result shows the state of the various general hospitals in Kogi state and particularly the features in place that enhances circulation of users within them. The results obtained from the field are discussed below:

The Hospital Building Types

Basically, building types within the hospital are bungalows, storey buildings and or a mix of both bungalow and storey buildings. Figure 3.0 below shows the distribution of the building types in the general hospitals as well as their arrangement on site. The research reveals that 92% of the hospitals are of solely bungalows and 8% of the hospitals are a mixture of bungalows and storey buildings. Also 100% of the hospitals studied have the different functions of the hospital housed in multiple buildings. The implication of having bungalows is the multiple buildings within the hospital complex which in turn helps to successfully separate dissimilar functions and consequently leads to less circulation complications within the hospital complex. It was noted that the arrangement of buildings in the hospital complex generally took the form of the branched structure of architectural circulation model.

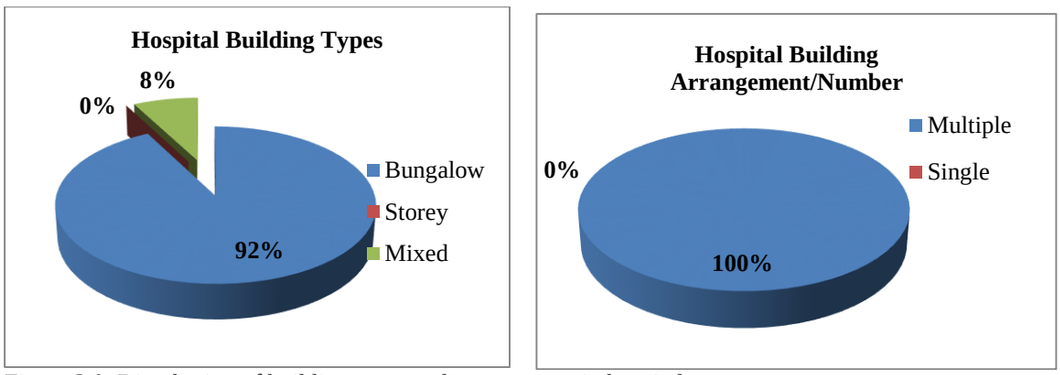

Figure 3.0: Distribution of building types and arrangement in hospitals
Source: Authors' fieldwork (2017)

Circulation Features

Figure 4.0 indicates the distribution of circulation features in the broad classification of vertical and horizontal circulation features. Since bungalows make up virtually all the structures in the hospitals it is for this reason that there basically no vertical circulation feature in the hospitals studied. Specifically only ramps for change in levels and a few stairs that made up the 8% shown in figure 4.0 are available. Features such as elevators and escalators were not found in any hospital. Literarily, horizontal circulation features are the sole means of conveyance of people within and around the hospital complexes. Entrance/exits, corridors, lobbies and doors are features common in all the hospitals studied for this research as indicated as 100% in figure 4.0 below.

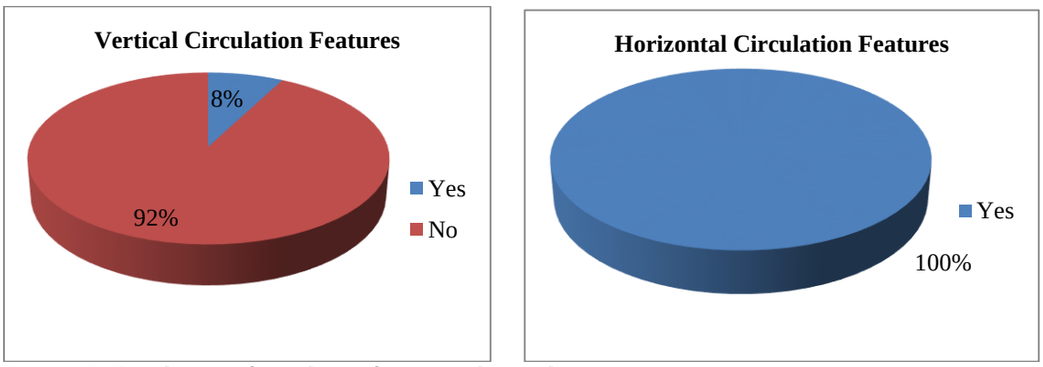

Figure 4.0: Distribution of circulation features in hospitals
Source: Authors' fieldwork (2017)

Width of Circulation Components

The width of circulation components is significant to the success of the circulation system in general. Data obtained and represented on the chart in figure 5.0 below show that 23% of the circulation components are between 900mm to 1500mm which is meant for areas with less or reduced traffic. Components ranging between 1501mm to 3000mm in width are 46% of the assessed features of the hospital. This range is fair and supports mild or average traffic within the hospital complex. The ideal with for an excellent circulation within the hospital especially for external traffic is above 3000mm in width. This category of circulation components accounts for 31% of the available provisions. With all the circulation routes within the hospital complex adopting a standard of a minimum of 3000mm, traffic congestion would greatly be resolved. It was also observed that during the course of the research, the floor finishing of the external circulation routes were majorly of mass concrete

and internal floor finishing were of either tiles or terrazzo. This finishing choice ensures a non-slippery surface.

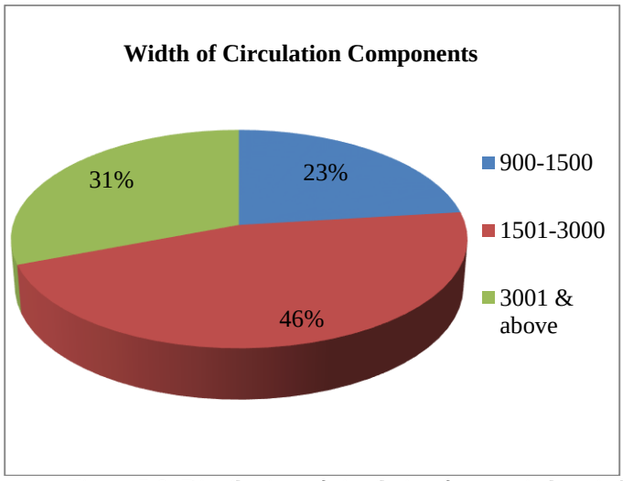

Figure 5.0: Distribution of circulation features in hospitals
Source: Authors' fieldwork (2017)

Entrance Doors

The door sizes are fairly adequate to support the average traffic situation in the hospitals. However, it is preferable for entrance doors to be 1500mm and above in width because it would be adequate for the traffic within the hospital even at peak of the traffic or during emergencies. Being able to see a person coming from the other side of the door is an important factor in the hospital circulation. There are likely to be accident such as bumping into one another in such instances. As indicated in figure 6.0 below, 54% of entrance door are made of opaque materials while 31% are translucent which implies that light passes through but one cannot see through it. 15% of the doors are made with transparent material or have provision for a see through portion. This 15% represent the ideal entrance doors for hospitals.

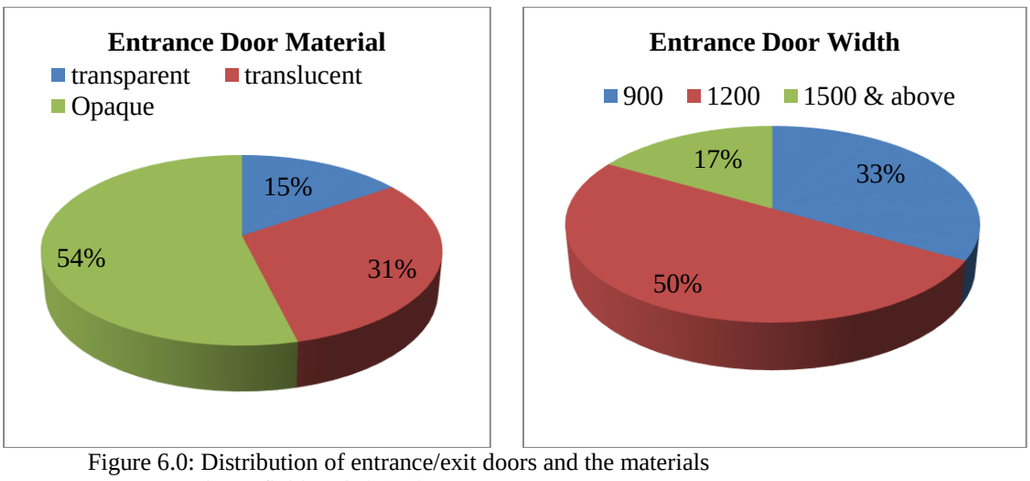

Figure 6.0: Distribution of entrance/exit doors and the materials
Source: Authors' fieldwork (2017)

Wayfinding Features

An effective circulation system ensures that its users are able to find thei ways to and fro their respective destinations with minimum effort and without getting lost. This is the reason it is of importance that wayfinding features are integrated In the design process of a hospital circulation system. During the course of this research, it was observed that 39% of the hospitals adopted strictly to use of signage and name plates naturally augmented with the voluntary directions given by staff. 15% of these hospitals had bill boards displaying the site layout of the hospital complex while 8% and 38% relied only on their staff or left users to their intuition and initiative to get around the hospital complex. Generally wayfinding in general hospitals within the state is very poor hence affects the proper function of the circulation systems adversely. Figure 7.0 below shows the percentage distribution of the wayfinding features in the general hospitals.

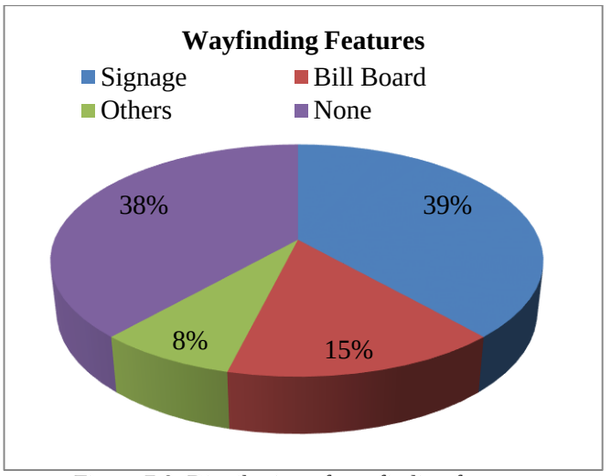

Figure 7.0: Distribution of wayfinding features
Source: Authors' fieldwork (2017)

Vehicular Circulation

Circulation within the hospital complex encompasses both vehicular and pedestrian circulation as well as effective separation of both to avoid a conflict in movement. Vehicular routes were excellently provided for 23% of the sample population as show in figure 8.0 with a little below adequate parking provisions. For 46% of the hospitals studied, the vehicular circulation design and provisions could be described as fair and could be improved upon. The remaining 31% of the hospitals have poor vehicular circulation and separation for pedestrian circulation within the hospital complex. Form the result of the study presented in figure 8.0, it is clear that vehicular circulation within the complexes of general hospitals within Kogi state are generally fair and those not support the optimum functioning of the circulation systems. This could and should be improved upon to make it more effective.

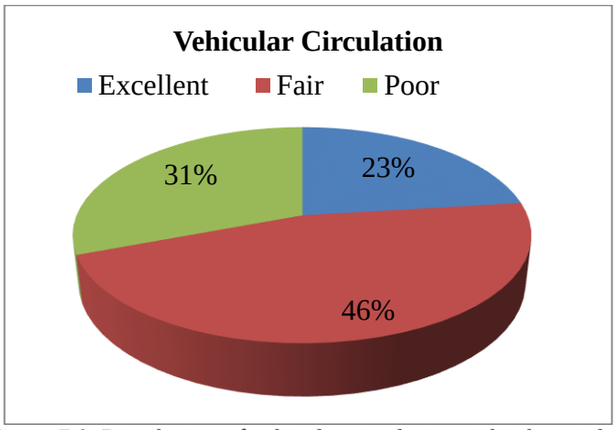

Figure 7.0: Distribution of vehicular circulation within hospital complexes
Source: Authors' fieldwork (2017)

CONCLUSION

Given the complexity of the interrelated functions of the hospital, there is the need to ensure the unobstructed constant movement of people and goods. The importance of its circulation system can never be over emphasised. Often times, unresolved human traffic patterns have caused a lot of problem in the hospitals including accidents such as collision between staff and patients and staff being worn out before the day is over. The design features that ensures a free flow of traffic and ease of way finding particularly in general hospitals include ramps and stairs for vertical circulation since over 90% of the buildings are bungalows with little changing in levels. For the horizontal circulation, features such as corridors, lobbies, entrance and exits and doors were effectively used for conveyance of people in and around the hospital complexes. Horizontal circulation is majorly utilized in the hospitals in the state. It is recommended that to enhance the effective circulation of people within the general hospitals in Kogi state in particular features such as designed pedestrian and circulation routes be provided and planning consideration should be given to buildings and facilities that require direct vehicular access either for emergencies of for normal services. It should be noted that wayfinding is integral for the proper functioning of the hospital and hence the hospitals should in cooperate in their designs all the features that ensure wayfinding for users

such as signage, name plates, location maps at strategic points, use of landmarks and bill boards displaying the hospital site layout. It is also recommended that all entrance doors should be made with see through materials in other to prevent head-on collision within the building and other doors should have provision for a see through.

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ADAPTATION OF INTERIOR DESIGN AS A THERAPEUTIC TOOL IN PAEDIATRIC HOSPITALS IN FEDERAL CAPITAL TERRITORY, NIGERIA.

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Interior design as a therapeutic tool in paediatric facilities means creating designs that are vital in promoting healing while offering a safe and comfortable environment to signal permanence and confidence, to achieve a delightful, pleasing and healthier environment, yet also seem non institutional playful and non-trite. This gives the patients a feeling of still being at home, assist in the treatment of the physical body and support the spiritual needs of the visitor; these two factors create a sense of holistic healing and relaxation. Various healing principles, adopted mainly from healthcare design will support the goals mentioned above. These will include the integration of colour theory, connection to nature, light, texture, and forms. The type of research method used is descriptive research and both quantitative and qualitative data were obtained through questionnaires, observation schedule, literature review and photographs. A total of 132 questionnaires were administered in the study area on the basis of 11 copies per hospital of which 126 were returned, one observation schedule was used for each hospital. The data collected for both were fed into SPSS were it was analysed and cross tabulated. Findings reveal that 38% of the hospitals made recreational use of colours while the remaining 62% of the hospitals made use of plain colours on walls, 28% had good furniture textures and fixtures, 71% had good natural and artificial lighting, and only 42% had playful morals on their walls. Based on these results, it was concluded that therapeutic healing is not something that is considered in hospital setting. This paper recommends that Children's hospitals should have playful designs and it should have a comforting feeling.

Keywords: *interior design, healing, paediatric, playful distraction, therapeutic*

INTRODUCTION

A paediatric hospital is a children's hospital which offers its services exclusively to children and adolescents. They can mostly serve children from birth up to the age of 18, in some instances, children can be treated until they finish high school or up to the age of 21.(Hardin, and Hackell, 2012),while the Nigerian setting allows for the age of 18 by the Federal Ministry of Health. Child health care refers to the total package of the wellbeing of a child in a holistic manner through preventive, promotive, curative and rehabilitative measures when curative measures fail. In addition to psychosocial support, children's hospitals have the added advantage of being staffed with professionals who are trained in treating children (Freeman, 2013). The stay of patients in hospitals usually is associated with anxiety, uncertainty and insecurity (Dijkstra, 2009) and increased level of stress (Van den Berg, 2005).

Interior design is the art and science of enhancing the internal and sometimes external outlook of a space or building, to achieve a delightful, pleasing, healthier, safe and more aesthetically engaging environment which appeals to the emotions of the end user (Nigerian institute of interior designers).

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Interior design is a broad profession that requires set of skills and technical knowledge; it emphasizes space planning, functional design, effective use of space, site inspections, conceptual development, programming and research, communicating with the stakeholders of a project, construction management, and execution of the design. An interior designer will competently handle the space planning and creation of decorative schemes at the same time as considering major structural changes (Simon, 2009).

Healing means to become sound, to make whole or healthy again from a wound or it is a process of restoration from damaged, unbalanced organism or a disease. It is a repair of living tissue, organs and biological system. This process may involve psychotherapy, pharmaceutical treatment or alternative approaches such as traditional spiritual, social and physical healing. (Bovenberg *et al*.,2010).According to (Kelty mental health, 2017), Some of the types of therapeutic healing includes; Recreational therapy, Play therapy, Creative arts therapy ,Group therapy, Family therapy, Emotion-focused therapy

Therapeutic healing means a state of complete physical, mental and social wellbeing which is influenced by an individual's health (Dolan et al., 2008),to restore health or cause an undesirable condition to be overcome, through positive effect on the body, mind and environment for a disease or ailment. It is a process of revitalization, relaxation and release at a profound level, which contributes to the well-being, recovery and healing of a patient and can reduce stress and stimulates the self-recovering ability of the patient (Bovenberg et al., 2010). The aim of this research is to determine interior design and therapeutic elements that can be used in paediatric hospital environment to enhance speedy recovery and reduced stress in children in the following ways: a.) Assist in the treatment of the physical body and b.) Support the spiritual needs of the visitor. These two factors will create a sense of holistic healing and relaxation (Fottler *et al*., 2000).The healing principles stated below will be adopted during the planning and design stages of the paediatric facility to support the goals mentioned above through artwork on walls, and machines, provision of interacting spaces, bright and controllable light fixtures, and the use of landscaping elements. Through the integration of a.) Colour Theory, b.) Connection to Nature, c.) Light, d.) Texture and e.) Forms (Coates, 2001).

Designing to heal

Healing environment became a crucial concept in the 1990s in designing and planning of medical facilities regardless of whether a definition for the term ''healing environment'' can be given (Woo and Lin, 2016),in contrast to medical treatment, it is a holistic environment that facilitates patients rehabilitation(Fottler *et al*.,2000) through emotional designs that provides pleasure for the viewers or users to satisfy patients psychological needs using diverse visuals(gardens, pictures, textures, light, and colours)and auditory (relaxing music and natural sounds).the enjoyment derived from nature can distract patients from their ailment, thus alleviating their pains, nature, green plants and an extensive space can effectively reduce stress, improve body immunity, and enhance human resilience.(Biley *et al.,2013).*

The Brattleboro Retreat's children's unit was the first inpatient unit renovated, completed in January 2012. The design team, which included staff clinicians in partnership with an architect and interior designer from Lavallee Brensinger (Manchester, N.H.), incorporated several functional yet child-friendly structures into the design. The result turned a previously drab environment into one that's bright, colourful, healing, and comforting. The nurses' station, for example, is embedded in a wall-sized "giving tree" motif inspired by Shel Silverstein's classic story of selflessness and happiness. The theme was chosen to reflect the compassionate care provided to children in the space and to incorporate something familiar to them, reducing a potentially clinical feel. A recreation room was a new addition for the Retreat and was designed for play. It includes recessed cubbies shaped like kidney beans and large enough for a child to climb inside and hang out (Brattleboro Retreat, 2017).As shown below.

Plate I Brattleboro retreat
Source: Brattleboro Retreat, 2017

The environment provides children with a space where they can feel in control and safe. Sensory integration techniques are effective in working with children who have learning disabilities, including autism as well as those suffering from trauma, so a sensory room was also developed in the unit to create a therapeutic environment for this approach as shown below. Special emphasis was placed on sound, lighting, colours, and textures, with the room featuring a floor-to-ceiling bubble tube display, a glider for gentle rocking, and dimmable lights—all of which help children process sensory information and manage emotions. The Retreat set out to create a comforting and homelike environment that would feel welcoming. Programmatically, the space needed to support interaction and communicate a sense of belonging (Brattleboro Retreat, 2017).

Plate II Brattleboro Retreat
Source: Brattleboro Retreat, 2017

Interior design as a therapeutic tool

The use of interior design in paediatric hospitals to foster healing is an important concept for health professionals involved in care giving to minimize the effects of hospitalization, as this is essential to help one overcome the negative aspects inherent in sickness and disease.(Kose, 2003). Playful and stimulating activities in the hospital environment are a catalyst in the adaptation process, as they seek to achieve joy, entertainment and the creation of a more pleasant environment, promoting the integration among health professional, child, adolescent and their family, in addition to shifting the focus from the disease, even if momentarily, thus helping them to adapt and face the health-disease process and hospitalization. Consequently, the benefits of playful activities stand out in the sphere of paediatrics, especially in the sense of improving the way disease and hospitalization are handled and promoting the bond between child, adolescent, family and nursing staffs shown in the picture above (Huisman *et al.*,2012).

Plate III University of Missouri Children's Hospital
Source:Mu Health Care

RESEARCH METHOD

The method employed to carry out this study was descriptive survey. The study population was 207 registered hospitals in the Federal Capital Territory of Nigeria from which a sample size of 12 hospitals were drawn using stratified random sampling the 207 registered hospitals were divided into 6 strata based on the 6 area councils in federal capital territory where 2 hospitals were selected randomly from each area council. An observation schedule was filled out to get data on the buildings current state. Questionnaires were administered to staff, parents and young adults to determine their perception on the effectiveness on the use of interior design as a therapeutic tool in paediatric hospitals. A total of 132 copies of questionnaires were distributed on the basis of 11 copies per hospital of which 126 were returned. The data collected was fed into SPSS where it was analysed using descriptive statistical tools, such as measures of central tendency (mean) and measures of frequency (percentage) and cross tabulated. 12 Observation schedules were also filled 1 in each hospital to determine if any interior design and healing elements were used.

Table 1.0 Distribution of Area councils and name of Hospitals selected

Serial no.	Name of area council	Name of Hospital
1	**Abuja municipal**	Yushau Alkali, National Hospital
2	Bwari	Summit, Medicare Hospital
3	Kuje	Alfad, Jalingo Hospital
4	Gwagwalada	Living stream, General Hospital
5	Kwali	Rhema, General Hospital
6	Abaji	Specialist Hospital, Lafiak
Total	**6**	**12**

RESULTS AND DISCUSSIONS

Adaptation forms

Space

The shaping of space into rooms of specific configurations is the primary art of the interior designer. Several issues impact the proportion of rooms and their location in plan, including the intended functions of rooms, the way furniture and accessories will fill out the space, and the limitations imposed by accessibility and building codes. At a more sophisticated level, spaces and rooms can be knitted together in a sequence of spaces that provoke discovery, incite delight and give comfort to patients.

Furniture

Whether incorporated into a private office or into an open plan, modular furniture offers flexibility to an environment. There are three basic types of modular furniture systems: freestanding, panel-based, or table-based. Bad furniture choice can provoke distaste and fatigue in both staff and patients.

Light

Light is the first thing a designer considers as it is the prime animator of space, with the cycle of illumination ranging from daylight, sunlight, to moonlight and how it relates to the lives of an individual. There must be a balance of natural and artificial light to mould a space, and create a functional and alluring frame. Natural light is known to refresh the human mind.

Colour

Colour is a physical phenomenon, and the range of colours stretches far beyond what the human eye is capable of perceiving. Colour can be associated with emotion-speaking of certain colours as warm (reds, oranges, yellows) and others as cool (blues, greens).colours can be divided into two distinct categories: colour as an applied surface and colour as integral to a material. In a hospital setting it can help in uplifting the mood of the people in the environment.

The results obtained through observation schedules filled out in the 12 hospitals, 1 in each were recorded as follows:

The results show that only 28% of the Hospitals visited made use of different colours to enhance the mood within the environment while the remaining 72% used plain off white colours , 35% had depicted art works on their walls, 92% had adequate lights within and outside the hospitals through both natural(large windows/openings) and artificial lights, and 100% of the visited hospitals had landscaped their environment with shrubs, trees, climbers and flowers to beautify its looks while only 7% of these hospitals have comfortable furniture for the patients and their families to relax while providing care for their sick wards, while the remaining 93% had no furniture's at all for guardians and parents and in a case where they were available the furniture's were hard and caused discomfort.

Table 2.0 Interior design components in selected Hospitals

Serial no	Name of hospital	Use of colour	Furniture	Light	space	Murals	Landscape
1	Yushau Alkali	1	0	1	0	1	1
2	National hospital	0	0	1	0	1	1
3	Specialist Gwagwalada	0	0	1	0	0	1
4	Living stream Gwagwalada	0	0	1	1	0	1
5	Summit hospt. Bwari	0	0	1	1	0	1
6	Medicare hospt. Bwari	1	0	1	0	1	1
7	Alfad hospt. Kuje	0	1	0	1	0	1
8	Jalingo hospt. Kuje	1	0	1	1	0	1
9	Lafiak hospt. Abaji	0	0	1	1	0	1
10	General hospt. Abaji	0	0	1	0	0	1
11	General hospt. Kwali	0	0	1	0	0	1
12	Rhema foundation Kwali	0	0	1	1	0	1
Total	**12**	**28%**	**7%**	**92%**	**50%**	**35%**	**100%**

Source: Authors field work (2017)

Health care facilities are now trending towards user satisfaction, comfort, aesthetics and safety through visual and auditory environments The pie chart in figure 1.0 shows the types of walls in the selected hospital environment 35% shows that the walls are just plain coloured without any form of art work or morals to make the environment look appealing and inviting to kids there by distracting them from their pain.

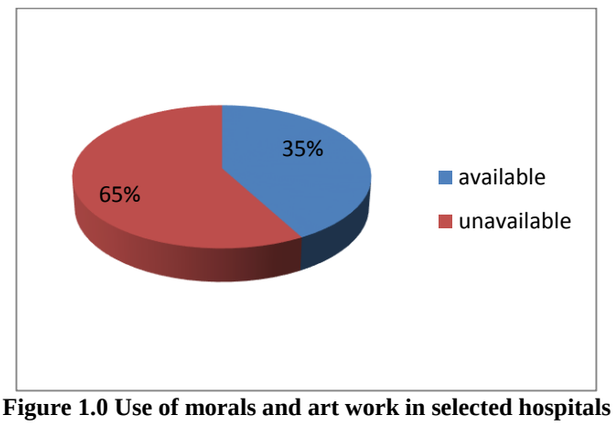

Figure 1.0 Use of morals and art work in selected hospitals

Source: *Authors' field work (2017)*

Toys and games are the focus for children lives and they enable doctors and people to communicate with kids the more engaged they are the more the activities will divert their attention away from their sickness and ailment, but the field research carried out indicates that 86% of the hospitals within the federal capital territory have no engaging activities for patients and only 14% have some sort of playful events.

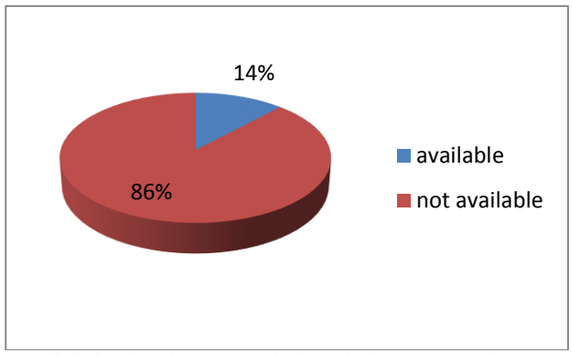

Figure 2.0 Availability of activity within the hospital facility
Source: *Authors' field work (2017)*

86% of the furniture's in the hospitals selected had hard surfaces and were uncomfortable to sit on for a long period of time which was usually the case for patients to queue before seeing the doctor. The field result shows that only 7% of the hospitals had comfortable furniture's.

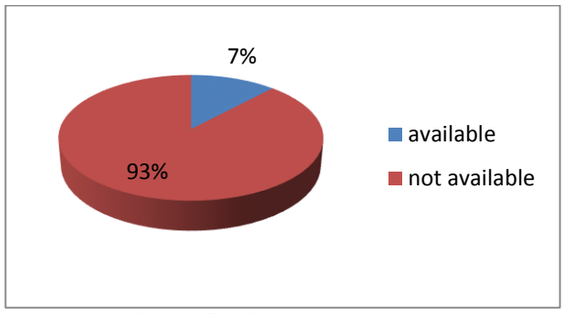

Figure 3.0 Furniture textures
Source: *Authors' field work (2017)*

Of the selected hospitals visited only 28% had private room which some parents or guardians tend to like more,7% had naturally enticing environment,58% of the hospitals were rather noisy which causes discomfort in patients, and only 14%had any form of activity for the children.

Table 3.0 Therapeutic environment components in selected Hospitals

Serial no	Name of hospital	privacy	nature	Noise control	activity	space
1	Yushau Alkali	1	0	1	1	1
2	National hospital	0	0	0	0	1
3	Specialist Gwagwalada	0	0	0	0	0
4	Living stream Gwagwalada	0	0	0	0	0
5	Summit hospt. Bwari	0	0	0	0	0
6	Medicare hospt. Bwari	1	0	1	0	1
7	Alfad hospt. Kuje	0	1	0	0	0
8	Jalingo hospt. Kuje	0	0	1	0	0
9	Lafiak hospt. Abaji	0	0	1	0	0
10	General hospt. Abaji	0	0	0	0	0
11	General hospt. Kwali	0	0	0	0	0
12	Rhema foundation Kwali	0	0	1	1	0
Total	**12**	**28%**	**7%**	**42%**	**14%**	**35%**

Source: *Authors' field work (2017)*

When it comes to comfort privacy is very important because it is known that patients tend to withhold information when they think that they can be heard by other people as a result there is a need for private rooms, and sometimes shared room can lead to spread of disease. Data shows that only 28% of the hospitals have privacy in their rooms 72% have open wards.

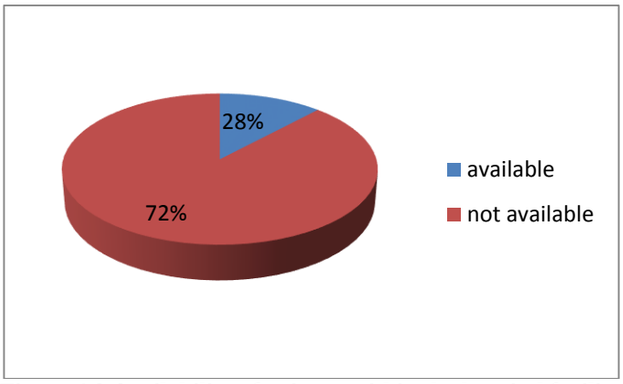

Figure 4.0 Availability of privacy within the hospital facility
Source: *Authors' field work (2017)*

The wards are always noisy because they are open spaces made to accommodate a large number of patients and such rooms have a large number of family members tending to their sick relatives, 42%of the hospitals selected have private or double rooms which reduces the noise and irritation in patients and mistakes from staff.

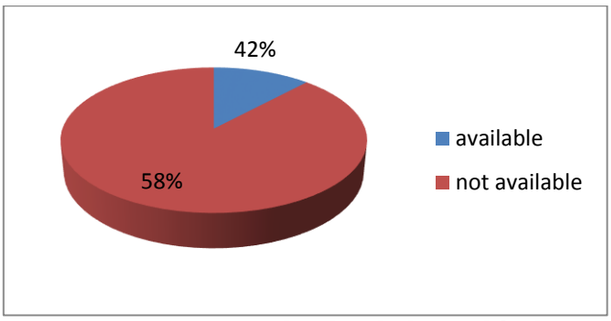

Figure 5.0 Noise control within the hospital facility
Source: *Authors' field work (2017)*

Respondents' perception on application of interior design elements as therapeutic tool

The 132 questionnaires distributed of which 126 were retrieved from the field survey were used to analyse the patient's response on how they felt about their environment. The data collated was fed into SPSS and cross tabulated to determine their level of satisfaction or dissatisfaction. The chart below shows that 95% of the interviewed persons responded well to the survey, 5% of the response was invalid and 1% did not return their questionnaires.

Table 4.0 Breakdown of Administered Questionnaires

respondents	frequency
valid	126
invalid	4
Not returned	2
Total	**132**

Source: *Authors' field work (2017)*

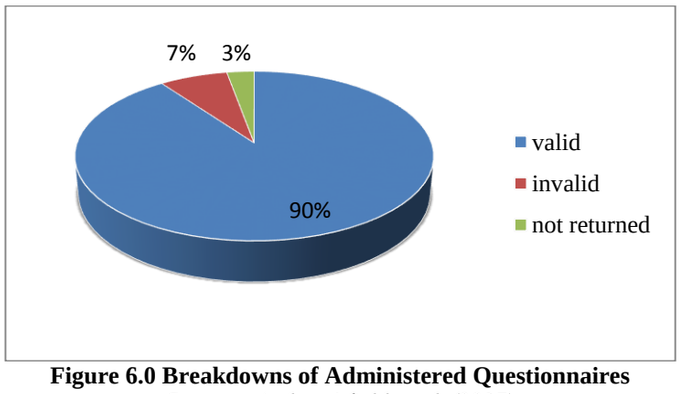

Figure 6.0 Breakdowns of Administered Questionnaires
Source: *Authors' field work (2017)*

Respondents per opinion on Satisfaction with interior design as a therapeutic tool

Using Likert scale the patients response were measured to determine their level of satisfaction or dissatisfaction with their environment the results were interpreted on a range of scale allocated from 1 to 4 on the basis of 1 being very dissatisfied and 4 being very satisfied.

1.0	-	1.49	Very Dissatisfied
1.5	-	2.49	Dissatisfied
2.5	-	3.49	Satisfied
	>	3.5	Very Satisfied

Table 5.0 Response per opinion on satisfaction or dissatisfaction of therapeutic elements

variables	v.dissatisfied (X1)	Dissatisfied (X2)	Satisfied (X3)	v.satisfied(X4)	total
Privacy in wards	59	35	19	13	126
Availability of nature	20	12	41	53	126
Adequate lighting	14	33	31	48	126
Availability of activities	58	42	17	9	126
Use of murals	53	47	22	4	126
Use of colours	61	54	6	5	126
Noise control	52	43	18	13	126
furniture	67	42	10	7	126

Source: *Authors' field work (2017)*

Table 6.0 Sum of responses on respondents Opinion on satisfaction or dissatisfaction of therapeutic elements

variables	v.dissatisfied (X1)	Dissatisfied (X2)	Satisfied (X3)	v.satisfied(X4)	total
Privacy in wards	59	70	57	52	238
Availability of nature	20	24	123	212	379
Adequate lighting	14	66	93	192	365
Availability of activities	58	84	51	36	229
Use of murals	53	94	66	16	229
Use of colours	61	108	18	20	207
Noise control	52	86	54	52	244
furniture	**67**	**84**	**30**	**28**	**209**

Source: *Authors' field work (2017)*

To determine the satisfaction or dissatisfaction level of each measured variable the sum of the scores gotten as presented in table 6.0 above were divided by the number of valid response (126) as depicted on table 4.0 for each section as shown in the table below to get the mean of each variable. From the interpretation of the results it can be seen that the respondents are dissatisfied with the rate or level at which interior elements are adopted in paediatric hospitals in the federal capital territory Abuja. The table shows a mean of 1.88888 for privacy in the wards which indicates a dissatisfaction in the way the room are this is so because most people prefer to have their privacy in terms of giving out information to the doctors or nurses, or just interacting with other family members, a mean of 1.81746 which shows that activities for the children are also at a dissatisfied level this means that there were no play room or activity room provided for the children to act as a distraction for them. With a mean of 3.00793 and 2.89682 the results show that the selected hospitals were properly landscaped and had adequate lighting.

Table 7.0 Respondents' opinion on satisfaction or dissatisfaction of therapeutic elements data interpretation

variables	sum	mean	Level of satisfaction
Privacy in wards	238	1.88888	Dissatisfied
Availability of nature	379	3.00793	Satisfied
Adequate lighting	365	2.89682	Satisfied
Availability of activities	229	1.81746	Dissatisfied
Use of murals	229	1.81746	Dissatisfied
Use of colours	207	1.64285	Dissatisfied
Noise control	244	1.93650	Dissatisfied
furniture	**209**	**1.65873**	**Dissatisfied**

Source: *Authors' field work (2017)*

CONCLUSION

Children are more sensitive to their environment but their perspective is often neglected in architectural planning and design. Improving on the aesthetics, comfort, safety and atmosphere of the hospital is a systematic process and requires efforts regarding: design, construction, operation, maintenance and understanding the users view regarding paediatric facility. There should be effort towards the comfort of the users through colours, lights, nature, form, and texture to achieve healing while ensuring that features that could have negative impact on their spiritual, social and psychological wellbeing are avoided.

Recommendations

- For a paediatric facility design that is geared towards healing the use of colours should be highly prioritised because colours connect between objects and affects our moods.
- Textures should be considered because it deals with surfaces and determines the physical look and feel of a space.
- Spaces should be allocated for play/activity rooms during design stage where children can relax.
- Children's hospitals in general should have playful designs on walls and equipment, and it should have a comforting feeling on the whole.

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ASSESSMENT OF DESIGN FEATURES FOR CROWD CONTROL IN SPORT CENTRES IN NIGERIAN UNIVERSITIES

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In view of the large crowd that attends sport events, the rate of crowd disaster and disorderliness is regularly high. An increase rate of accidents and injuries among participants at public events, particularly Sports Events has turned out to be one of the significant worries to researchers and professionals. Sport events in a student environment attracts crowd, the students, staff and other people who attends sport events constitute crowds whose safety must be guaranteed as crowded spaces are potentially risky. Therefore, the aim of this research is to assess the crowd control design features and strategies adopted in the design of Sport Complexes in selected Nigerian Universities. The research used a mixed method approach in the collection of data. This includes questionnaires, and interview on the respondents (students and staff) as well as participants' observation. These data were collected in five Nigerian Universities randomly selected. The study revealed that there are some salient spatial crowd control issues that are not featured in the design of sport centres. The paper therefore, recommends the integration of crowd control measures in the design of sport arena in Nigerian Universities.

Key words: Sport Centre, Crowd Control, Design Features, Nigerian Universities

INTRODUCTION

A crowd is a large number of people attending a particular event at a specific venue for a finite period of time (Memish et al, 2012). Examples of such events are concerts, religious and sporting events among others. Crowd control research focuses on improving the safety and wellbeing of crowd at events where a high flow of crowd is expected, one of such events is sport events. Sport events are being organized at various levels, one of these is the University sport. The university is the highest level of the tertiary educational institution of any country. Therefore, it is expected that sport events and facilities should be well developed and organized at this institutional level. Sport development at the University level will result in a substantial impact on National sports (Bamidele, 2012).

Crowd violence in sport centres has been a longstanding issue all over the world, however, various studies on crowd violence has been conducted in some countries. Lowrey (2002) carried out a study on football sport violence in England, and highlighted the causes of chaos such as alcohol intake, poor refereeing and fans rivalry. Krausz and Bauckhage (2012) asserted that in any large gatherings, such as sports and religious events, there is a high tendency of building up crowd densities whose actions may result in property destruction, injuries and death. For instance, the most notable sport crowd incidence in England occurred about twenty five years ago during the Football Association (FA) Cup semi-finals between Nottingham Forest and Liverpool whereby over 2000 spectators forced their way into a section of the Hillsborough Stadium in Sheffield which had already accommodated 1500 spectators. As thousands of people rushed into the stadium, the spectators in front were pinned against the fence that guarded the fans from the field and players. As a result of this, over 93 spectators died and more than 200 people were injured. The incidence was thereafter described as the worst ever sporting disaster in Britain's history (Kwalimwa, 2014).

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Jaiyeola et al., (2018). **ASSESSMENT OF DESIGN FEATURES FOR CROWD CONTROL IN SPORT CENTRES IN NIGERIAN UNIVERSITIES.** Contemporary Issues and Sustainable Practices in the Built Environment. School of Environmental Technology Conference, SETIC, 2018

Nigerian Universities sport centres is not an exception in matters involving crowd disasters during sport events. Sport events in a student environment attracts crowd, the University is made up of strong, talented, intelligent, skilful, and energetic youths whose interest in sports is relatively high. The students, staff and other people who attend sport events in the university constitutes crowds whose safety must be guaranteed as crowded spaces are potentially risky, especially in sport events such as the inter-university sport competition organised by the most notable Nigerian University Games Association (NUGA). Violence has negative effects and is often detrimental to victims. Odili (2002) confirms that violence in an educational institution adversely affects students' academic activities and performance. The invasion of the culture of cultism in the Nigerian educational system has become worrisome. Ogidefa (2008) reveals that reported cases of frequent cult activities are gradually turning the university campuses into unsafe ground for effective learning and other activities due to deviant acts and other anti-social behaviours been displayed by cult members. He further asserts that there is hardly any academic session without reported cases of cultism in most Nigerian institutions. This confirms the presence of students with harmful and criminal minded vision and mission in Nigerian University campuses.

However, in view of the vast range of spectators that attends the various sport events organised in the Nigerian University, the likelihood of crowd disaster and disorderliness is high. Crowd Congestion during sports events has been referred to as a reason for disasters in Sport Centres (Dimmock, 2005). Crowd control at sport complexes is a noteworthy worry for sport event coordinators. The safety of the participants is of vital significance and must be dealt with as a design need, to guarantee constant utilization of the facility. Controlling the movement and conduct of people in a crowd through passive design can help to diminish the rate of causalities and deaths that occur in buildings and significantly sport events.

There are various crowd management strategies that can be adopted in the design of a sport complex to successfully manage crowd. Studies related to this has not been carried out in sport centres in Nigerian universities, this research therefore, sought to assess the crowd management strategies that can be adopted in indoor sport complexes in selected Nigerian Universities. The findings of this study will provide the administration of Sports in Nigerian Universities with essential data on successful management of participants for all sport events holding in their centres. The research will likewise contribute to the existing body of knowledge on crowd control for sport events and create opportunity for additional research on crowd control and will also be utilized as reference material by future researchers dealing with similar or related studies. The study was guided by the following research questions;

1. What are the crowd control design strategies adopted in the university sport centres?

2. How effective are these strategies during peak sport events and emergency situation?

Sport Facilities

Sport facilities in this study refer to sport arena, for example, fields, halls, courts, running tracks, boxing rings, swimming pools, among others. Omolawon (2000) expressed that this part of sports management can't be over-emphasized. This is because that sporting facilities are expected to encourage the various activities required in sports. Bamidele (2012) affirmed that the sport facility is the most sensitive zone in all area of sports management. In his research, he also observed that the existing sports facilities in Nigerian institutions of learning are exceedingly lacking and substandard. The issues are the design of sports facilities and that of maintenance. The design and maintenance culture in most Nigerian universities is defective. A bigger than anticipated gatherings of fans striving to enter a sport centre could motivate the security agents to open the entrance gate to assuage the crowd pressure. Rather than easing pressure, the subsequent surge of fans striving to enter enclosed spaces makes a basic congestion of the space, thereby subjecting ineffectively maintained sports facilities to a hazard prone zone which results in high level of risk to crowds utilizing it (Beech and Chadwick, 2004). Aside from deaths and injuries, crowd disaster in sport complexes has different results. For example, it might prompt a restriction of the sport centre from facilitating other future sport events. Other consequences may include loss of assets due to closing of the centre, poor observer turn-up for future sport events, diminished enthusiasm for sports support and low sport ability inquiry and improvement (Young, 2002).

There are so many organized institutional as well as collegiate sports events in Nigerian Universities. The most notable is the Nigerian University Games Association (NUGA) which organises various university level sport events in Nigeria. NUGA hosts a bi-annual inter-university sport competition called the University Games. NUGA approves fifteen different sporting events at the University Games, these includes; track and field, badminton, basketball, chess, cricket, handball, hockey, judo, soccer, squash, swimming, table tennis, taekwondo, tennis, and volleyball.

Review of Relevant Studies on Crowd Control

Simpson (2000) designed a concept of crowd gathering phases which includes; the assembling process, the temporary gathering and the dispersal process as shown in Figure 3.0 below. He affirmed that crowd gathering is a process that has a beginning, middle and an end. The assembling process is described as the movement of people from various locations converging at a point within a stipulated period of time. At this phase, the size of the crowd is been determined by the number of access routes, way finding and signage, advance sale of tickets and the level of lighting within the venue. Assembling can occur either on impromptu basis or by an organized mobilization effort. Both involve the level of invitation by the event planners and the attendees.

The next phase which is the temporary gathering is the result of the assembling process. Benjamin (2000) defined temporary gathering as a collection of individuals and groups in a particular location performing individual and collective activities and actions. For instance, spectators at a basket ball sports will either individually or collectively mourn failures or cheer successes of their team during the sport event. The final crowd gathering phase is the dispersal process which involves the movement of people from a particular point to one or more alternative directions. Dispersal can occur based on routine, emergency or coerced basis (Simpson, 2000). Dispersal based on routine is as a result of specified time duration of the event under an absolutely normal condition. Emergency dispersal occurs when people evacuate a place as a result of an unforeseen disaster such as fire, explosion or flood. In emergency situations, effective communication is required to minimize the level of disaster at the centre. The communication process must be flexible and the information transferred must be clear, concise, courteous, correct, complete and correctly directed (Watt, 1998). Coercion dispersal occurs when security personnel resort to use of force to move people or groups who refuse to disperse after the event. The three phases of crowd gathering and dispersal process is shown in the figure below;

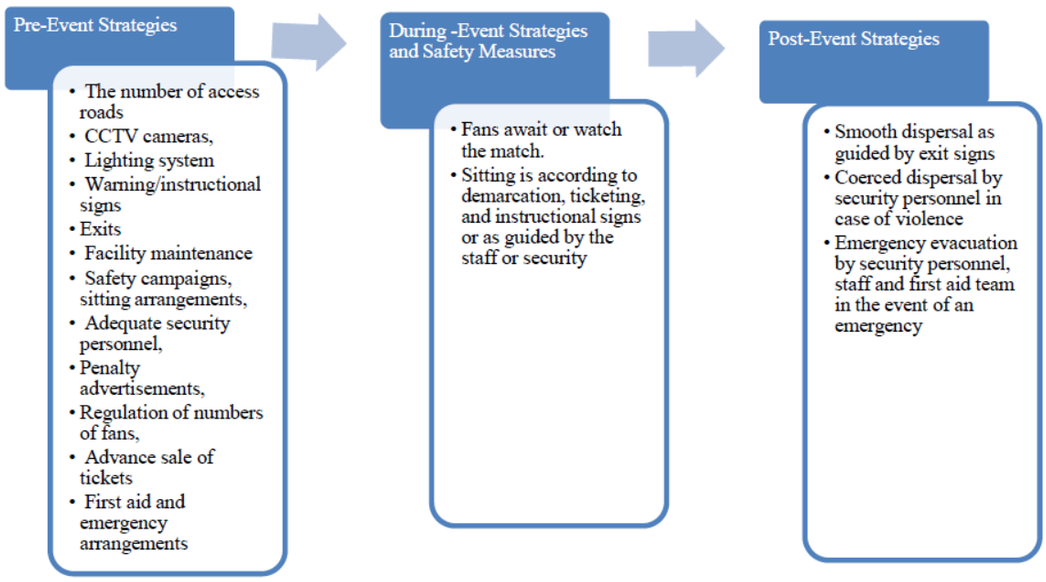

Figure 1.0: Crowd Gathering Phase and Dispersal {Source: Simpson (2000)}

According to Fruin (1993), architects and engineers usually give negligible considerations to the movement of individuals in their initial designs of buildings; most of these designs do not comply with the building standards. Consistency with building standards ensures that a building will function well during normal or emergency conditions. Designing for crowd control and management requires that the expected maximum occupancy levels of a space correlates with the movement capacities of all passageways, stairs, ramps, elevators, and other facilities. Architects have the duty of setting up a passive crowd management design

as a component of the life security assessment of a new public event facility. The design ought to set up the gathering and crowd movement abilities of all parts of the venue, a well designed circulation pattern will point out possible problem regions, and most importantly defines how the design will suit normal and emergency crowd movement.

The capacity of corridors, stairs, pedestrian and vehicular movements, and waiting spaces should be the focus of the architect in passive crowd control designs. The design of a building in which the users can easily understand the spaces and can also grasp the graphical image is dependent on the architectural design composition, spaces and details adopted in the design (Fruin, 1993). The design should give considerations to details such as; People's flow rate, Door measurements, Visibility of the exits, Door condition (open or closed), Building geometry, Obstacles while in transit to exits (such as furniture and columns), Circulation routes, Barriers, way finding and signage.

Crowd Dynamics and Behaviour at Sport Events

Crowd dynamics is the study of how, where and when crowds are formed. People's behaviour at public events is been influenced by various factors. Most of these factors are related to design while others are based on individuals or specific circumstances. The individual factors can be categorised into four main stages (Zachary and Carey, 2017);

1. To sense: at this stage, the individual obtains information from the environment through their sense knowledge
2. To interpret: at this stage the individual derives meaning to the information received
3. To decide: the individual takes a decision on what to do with the information
4. To act: the individual carries out an action based on the information.

A crowd is comprised of a gathering of individuals; it has been observed that the conduct of some individuals determine the conduct of the crowd in normal and panic circumstances (Benthom, 2016). At departure, it is human instinct to take after impulse by trying to get out as fast as would be prudent. In most cases, the diverse exit alternatives are not completely utilized; most people adopt a principle called `faster-is-slower', where quick uncoordinated movement by people make the entire crowd move slower. The instinct and experience of an individual is frequently vigorously depended on during panic circumstances, and this could result in either a positive or a negative action (Pan, 2007). It has been observed that most people will leave buildings along a route that they are most familiar and comfortable with, (in most cases; the main entry or exit). In this situation, experience works adversely because a high number of individuals will disregard alternative exits and congestion could occur at those exits being used as shown in figure 1. In non emergency circumstances a judicious decision could be made by assessing which of the exits is most suitable and picking the one that minimises the exit time. However, in a panic circumstance the degree to which an individual reasonably picks an exit relies on time and the level of the perceived danger.

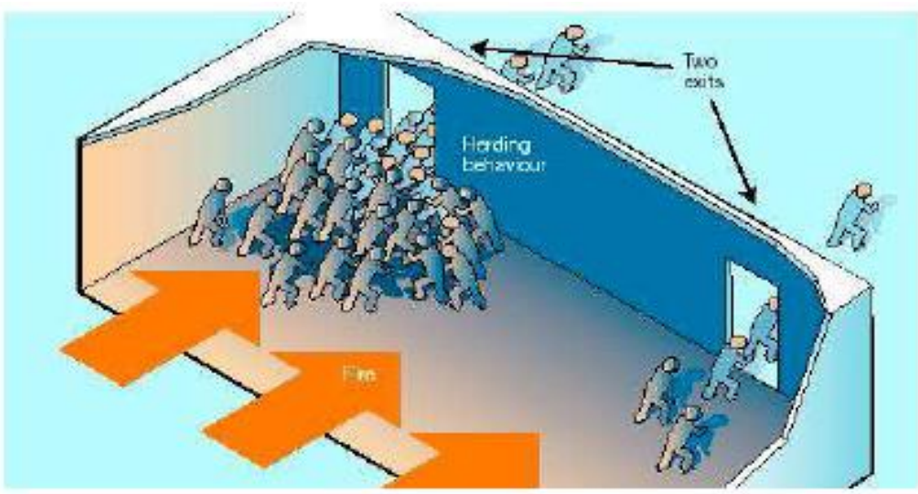

Figure 2.0: Crowd trying to escape from a Smoke-Filled Room [Source: Helbing and Molnar, 2001]

Crowd Disaster Process

The causes of crowd disaster can be classified into structural failure as a result of higher than expected level of attendance, Crowd Behaviours which are the actions and reaction to

situations and events by individuals making up a crowd, and natural occurrence such as heavy rainfall (National Disaster Management Authority(NDMA), 2014). Due to these factors, a form of Panic or excitement is been created in the minds of the spectators/users of the facility, which further leads to evacuation or crowd congestion. In an evacuation circumstance, there is a critical change in the way that individuals associate with each other. People who are terrified follow up on impulses which may not align with social standards. High level of perceived danger can prompt more physical interactions between individuals which steadily slow down the crowd. People pushed to the ground can be trampled over, turning out to be noticeably resolute items which block the evacuation routes of other individuals. People who lack experience in evacuation circumstances will probably look to the conduct of others as a guide on their behaviour.

Crowd incidence in sport events has been a longstanding issue. As indicated by Lewis (2007), there are six most basic types of spectator's aggression: verbal, which incorporates singing, chanting and hollering insults or obscenities; signalling for example, signalling to others with threatening or vulgar movements; 'missile' i.e. throwing which incorporates throwing things, for example, food, drinks, blocks, bottles, broken seats and mobile phones at specific or random targets; swarming, for example, rushing to the field or stage, and attempting to crash the entryways to pick up passage; or racing to the exit, both of which may bring about damage or demise from trampling; property devastation which incorporates thumping down sound frameworks, tearing up the playing field, and damaging the setting or different properties; physical attacks which incorporate spitting, kicking, pushing, clench hand battling, stabbings and shooting. In addition, figure 2 below summarises the factors responsible for crowd disaster in public event such as sports.

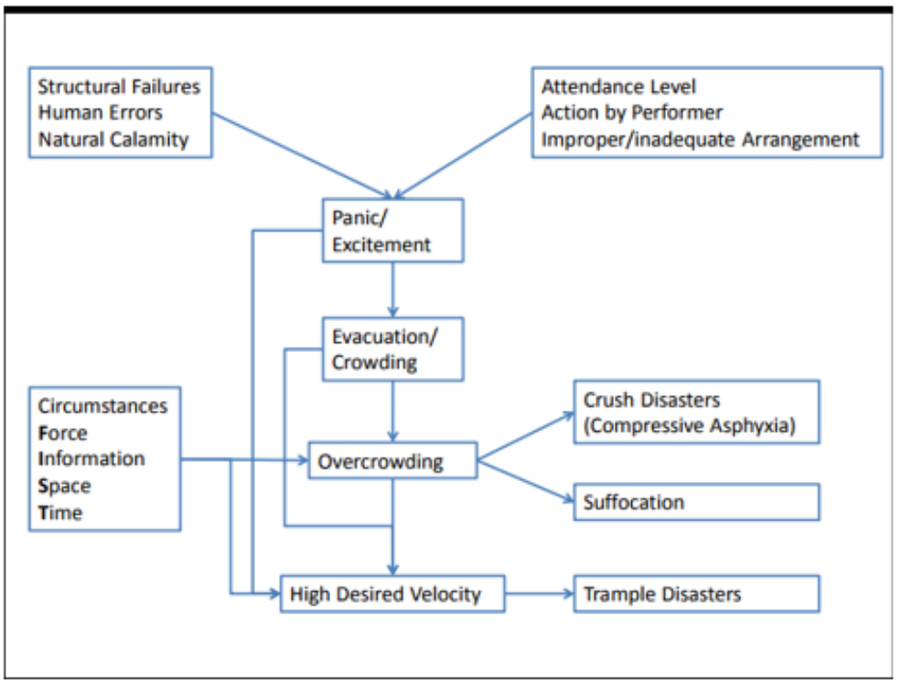

Figure 2.0: Crowd Disaster Process
Source: (National Disaster Management Authority(NDMA), 2014)

RESEARCH METHODOLOGY

The research methodology adopted in the course of this study is the qualitative research approach. The qualitative research methods mostly makes use of the interview, journals, observations and literatures to obtained and analyse qualitative data. In addition to the information obtained from reviewed literature, this research also adopts the use of an in depth interview, and a prepared observation schedule in obtaining data. Burns (1999) expressed that the use of interviews are a popular and most reliable means of obtaining qualitative data because it enables the researcher to obtain first hand information from the respondents. Flick (2006) adds that the purpose of interview is to reveal existing knowledge in a way that can be expressed in the form of answers and so become accessible to interpretation. He also confirms that the use interviews enables high rate of response from the respondents. Flick (2006) also asserts that observation is mostly adequate in observing events as they naturally

occur. More importantly, observation enables the researcher to combine it with checklists and interviews to collect relatively objective firsthand data.

However, in the course of this research, in-depth interviews were conducted with respondents who are the sport officials, students and staff of the institution whereby information such as capacity of sport hall, number of participants at peak period, time and period of usage of the sport facility, type of spectator, adequacy during emergency, nature of Crowd Violence experienced in the past among others were gathered. On the other hand, the observation schedule which is was constructed based on the research questions and objectives which was used to obtain information on availability, strategic positioning, number, sizes, adequacy, design and functionality of various crowd control design features adopted in the studied sport complexes. These variables were studied in comparison with the recommendations by the Department for culture, media, and sports (2008)

Five randomly selected Federal Universities were studied out of the forty Federal Universities in Nigeria. Federal Universities in Nigeria were selected as the population sample because every Federal University is expected to reflect the federal image and character of the country in terms of admission (heterogeneous mix of students), facilities and academics. These five were selected on the basis that they have either hosted or have the potential to host (having hosted pre-NUGA games) the bi-annual interuniversity sport competition organized by the Nigerian University Games Association (NUGA). Due to the vast number of participants and spectators attending the NUGA games event, these universities would have adopted some strategies in controlling the crowd and ensuring the safety of the participants at the event. Hence, this crowd control strategies were studied in the course of this research and also data were collected based on the prepared observation checklist which analyses variables such as; the number of entrance and exits available, the width of the doors and walkways, availability of way finding and signage, use of barriers, type of flooring materials, and consideration for disabled spectators. While the questionnaires administered were based on the total population of students in the University, the capacity of the stadium, the size of the crowd at sport centre at peak period, the behaviour of the crowd before, during and after the event, the time and period of events, the nature of crowd violence experienced in the past and recommendations from the respondents.

The five university sport centres studied are; Obafemi Awolowo University, Ife (OAU IFE), University of Ibadan (UNI IBADAN), Ahmadu Bello University, Zaria (ABU ZARIA), Federal University of Technology, Minna (FUT MINNA), and University of Benin (UNI-BEN). Table 1.0 below shows the names of institutions, their year of establishments, the students and staff population of the studied universities, and the last time the institutions hosted the NUGA games event.

Table 1.0: Institutions Studied (Source: Authors' fieldwork, 2017)

Institution	Year of Establishment	Students Population	staff Population	Number of Editions hosted	Most recent year of Host NUGA Games
OAU IFE	**1962**	**26,000**	**5,000**	**3**	**2014**
UNI IBADAN	**1948**	**19,521**	**6288**	**4**	**2002**
ABU ZARIA	**1962**	**49436**	**6177**	**3**	**2001**
FUT MINNA	**1983**	**20,000**	**3500**	**potential host**	**-**
UNI-BEN	**1970**	**56,501**	**5744**	**1**	**2011**

RESULTS AND DISCUSSION

The findings from the study revealed that there are some salient spatial crowd control issues that are not featured in the design of sport centres. The findings of the research were represented in tables and charts. Figure 3.0 represents the findings on the type of facility that attracts crowd in the studied universities.

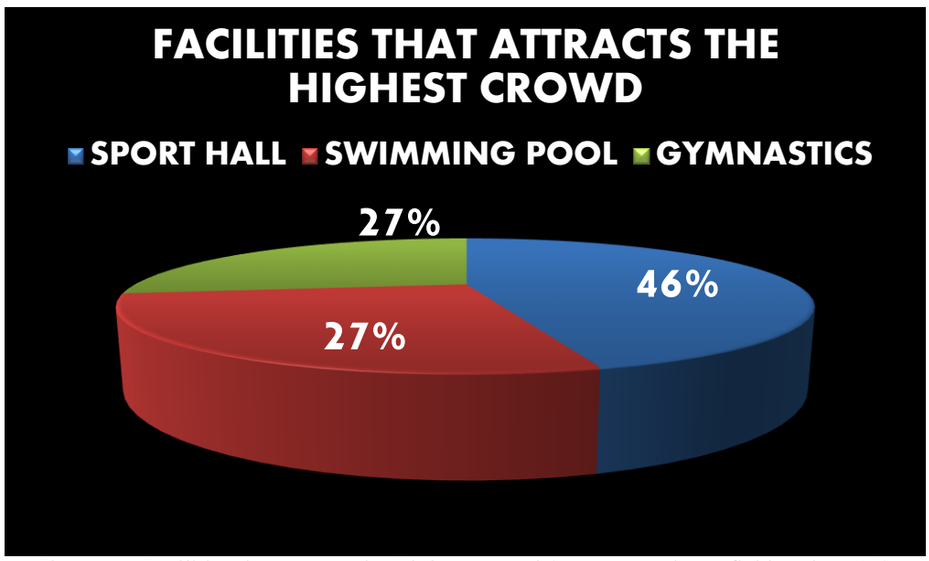

Figure 3.0 Facilities that attracts the Highest Crowd (Source: Authors' fieldwork, 2017)

The chart in Figure 3.0 shows that 46% of the users/spectators of the sport facilities of the Federal Universities visited are attracted to the sport hall. The sport hall is a large indoor facility used for multiple sporting activities such as badminton, volley ball, basketball among others. Figure 3.1 below shows an image of a crowded sport hall of one the studied Federal universities. Other facilities such as the gymnasium and the swimming pool attract 27% of the crowd at the sport facility.

Figure 3.1 Crowds at Ahmadu Bello University Sport Hall

Table 3.0 below shows the analysis of the major point of crowd congestion at the sport facilities study;

Table 3.0 Major Point of Crowd Congestion in Sport Hall

NAME OF UNIVERSITY	MAJOR POINT OF CROWD CONGESTION IN SPORT HALL			
	ENTRANCES	EXITS	TICKET POINT	CORE AREAS
OAU IFE	✓	✓	✓	✓
UNI IBADAN		✓		
ABU ZARIA	✓	✓		
FUT MINNA		✓		✓
UNI-BEN	✓	✓	✓	✓
TOTAL	3	5	2	3

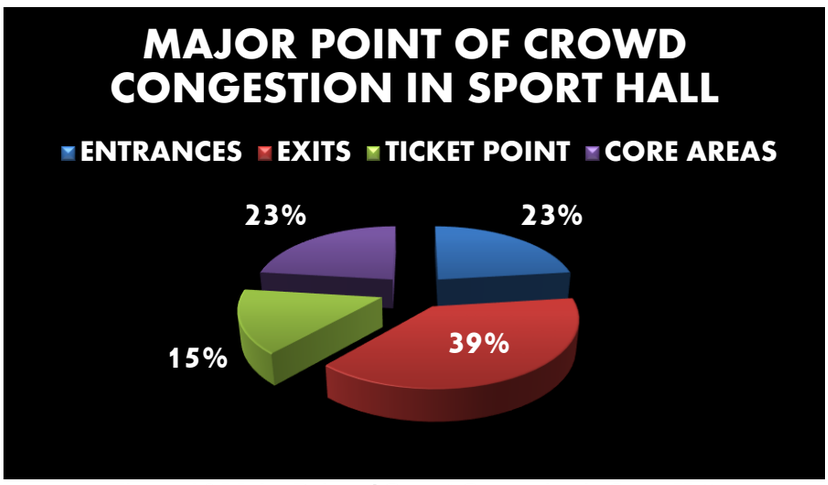

Figure 4.0 Major Point of Crowd Congestion in Sport Hall

The data obtained from table 3.0 was analysed in a chart shown in Figure 4.0 above. Crowd congestion in 39% of the studied Federal universities occurs at the exit. The findings were also confirmed through an interview with one of the officials of the sport facility during the field work. Passive crowd control strategies such as multiple number of exits, opening of exit doors and gates, use of barriers, way finding and signage system to coordinate crowd movement towards the exit points to avoid congestion and proper communication of emergency should be adopted in sport facilities to minimise crowd congestion. Other points of crowd congestions discovered during this research are the ticket points, the core areas such as stairs, entrance, passage ways and corridors. The charts in Figure 5.0 show that emergency exits are available in only 62% of the studied Universities. Also, 40% of the studied Universities made provision for two numbers of exits for spectators and users of the building after the event. Furthermore, the widths of the access door, walkways and corridors were also studied and analysed in Figures 6.0, 7.0 and 8.0.

Figure 5.0 Numbers of Exit Points at Post Event and Availability of Emergency Exits

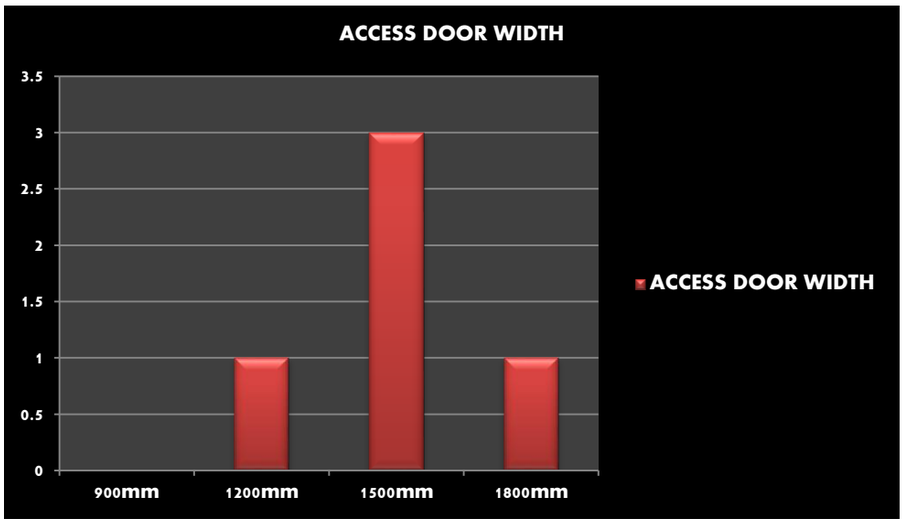

Figure 6.0 Widths of the Access Doors

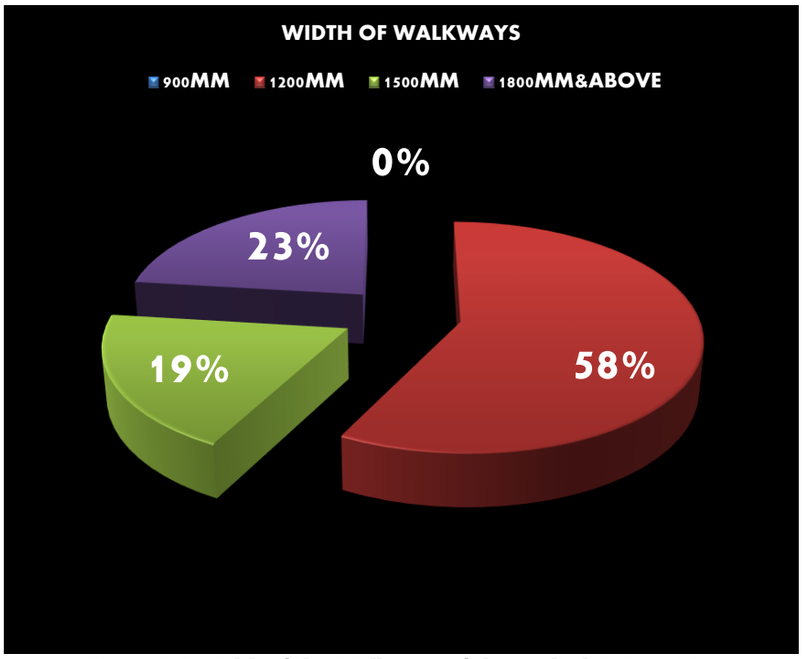

Figure 7.0 Width of the Walkways of the studied Universities

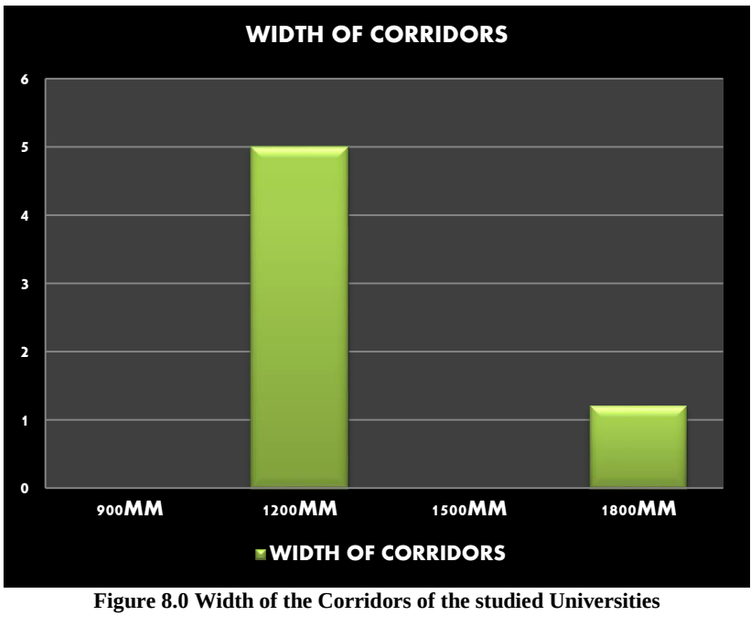

Figure 8.0 Width of the Corridors of the studied Universities

CONCLUSION AND RECOMMENDATIONS

The crowd control design strategies adopted in a higher proportion of the studied universities is considered partially adequate and inadequate in some cases because of inadequate coordination of dispersal process of crowds towards the exits, limited number of exits, partially adequate door and walkway sizes. Research findings also revealed that there is no special provision for the disabled which could result in slow movement which further leads to congestion at entrance or exits. Most of the studied universities did not provide a separate entrance and exit for the players which may result in rivalry among spectators. Also, a high proportion of the studied university have no provision for emergency exit. The available exits may be insufficient during emergency which could result in a high rate of casualties.

Therefore, based on the findings and the conclusion drawn from this study, the paper recommends the design of multiple entries and exits that will cater for normal and emergency conditions. There is a need for the design of sport facilities to make special provision for the disabled spectators and participants. Considerations such as ramps, special entry/exit, separate sitting area and conveniences will minimise the rate of crowd slow movement and congestion as a result of wheel chair users and disabled spectators. The paper also recommends the integration of crowd control design features like the use of signage, way finding and barriers in the design of sport facilities in Nigerian Universities.

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INTEGRATION OF CROWD CONTROL MECHANISMS IN CIVIC CENTRE DESIGN IN KADUNA STATE, NIGERIA

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The effective limitation of people in crowded events such as that of the civic centre and large public gathering remains a challenge mainly due to uncontrollable buildup of crowds, their behaviour and lack of event management. Evacuation of people in normal and during emergency situations is an important aspect to consider in building design. The purpose of this project is to evaluate the effectiveness of crowd control mechanisms towards quick evacuation, escape or control of crowds in normal and emergency situations in buildings. Understanding this behaviour can be very important in the safe design of event halls and other places of large scale public gathering, especially in the case of possible emergency situations. For this reason crowd control is of great interest to architects. Structured questionnaires forms a major part of data collection tool that were used in collecting data from the population studied. Field research method was adopted as it avails the most appropriate scenario for the collection of the necessary data for the studies. The Statistical package for social sciences (SPSS) is the statistical tool that was used in this study for analysis to ensure accuracy in the findings. Primary and secondary data were use in understanding the relationship of space in relation to crowd control. The result shows that a congested public space that lacks crowd control leads to improper behaviour which in turn causes trampling and stampedes. It also shows that public spaces should be given attention in number of attendance in events compare with capacity of the event hall. Thus, it is highly significant that building design should be considered as an integral part of crowd control.

Keyword*: Architecture, integration, crowd, control, civic centre.*

INTRODUCTION

In Nigeria, civic centres are opening up a new avenue for addressing community compliance in various areas like disease, poverty alleviation, and politics. Mutual distrust and suspicion between inhabitants of local communities and herdsmen is perhaps Nigerians' most recent internal security challenge. To address the subject, there is the need to develop a strategic initiative of convening meetings which makes civic centre building important to help bring about such meetings and other forms of interactions to the people especial lly those at the grassroots. Despite efforts of government in providing security by many measures put in place, insecurity is still high (Achumba and Ighomereho, 2013). The lack of appropriate information on tools use for agricultural purposes in order to enhance knowledge on sustainable agriculture has made government to come up with development strategies in Nigeria. The strategies put in place do not help engage and sustain the interest of citizens nor generate very useful information thereby making it inefficient for such policies to the get to people at the grassroots. All these, makes the people to be cynical about government in the process causing distrust thereby widening the gap between government and the citizens (Lukensmeyer and Brigham, 2002). The provision of place for social gathering is essential in reaching out to people. Prior to the advent of colonial administration in Nigeria, Communities were responsible for constructing of homesteads used as shelters, clearing path way or roads which provides access to farm lands and houses, construction of bridges and for the provision of other social amenities required by the people (Akpomuvie, 2010). The communities rely on each other to confront the challenges in their immediate environment.

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Civic centres have become important, due to the growing trend in politics in the country. As a result of the need to congregate to get some form of entertainment and as well discuss various issues affecting the peace and progress of our communities and the nation at large. Civic centres have been realized by government and corporations as a venue where important communication and information is passed across to the grass roots in order to bring the communities together to discuss issues toward making progress as a society. Often when programmes are organized by the government to reach the people at the grassroots it attracts large participation from people. This often leads to halls and venues use in engaging the people to be very crowded and inadequate for such gathering.

Today, there are quite a number of activities that attracts a lot of people to come together. Many of this includes events that are related to entertainments, civic or educational, cultural and religious activities which are often held all over the world. As large numbers of people gather for such events, buildings and places use for such gathering pose a serious challenge of safety and control of occupants. Crowds or large concentration of people frequently occurs in modern societies. A major event in civic centre can attract large number of people as a result of the gains that comes with such event in form of rallies, campaigns and entertainment where people meet with their elected or contesting policy makers. It also serves as venues for involving the community in social welfare programmes which often involved large mass gathering, as such crowd control become important.

Historical characteristics of crowd

A crowded environment is often risk-prone. The risk involved is as result of the inevitable buildup of the population (Russ, 2000). In any given situation, when crowd gather risks abound. A boat that is overloaded is liable to sink. An overloaded and overcrowded structural platform is liable to fail and collapse. Likewise, any overcrowded public event, arena or a large congregation is likely to 'burst'. The 'bursting' in a crowded public congregation often results from the impulsive behaviour of humans in an uncontrolled crowded environment.

The increase in population growth and the tendency of people to gather for a similar objective or interest makes events in general, especially social ones, to become an increasingly crowded. Crowd is mostly made up by gathering of spectators and participants in an event leading to a cluster, be it religious or social in nature. In social events, the crowd is mostly made up of participants who are gathered for civic or social and political duties.

Mass gathering is referred to as an assembly of more than 1000 person at a particular place for a certain period of time (Singh and Bisht, 2014). It is usually a prearrange event held for a particular period of time at a particular location. Large crowded gatherings create disturbances and make a section of that environment and societies where they are gathered to experience many form of difficulties. Many deaths and injuries at mass gatherings have occurred continuously over a range of events and in different countries around the world (Okoli and Nnorom, 2007). In such gatherings especially festivals and concerts events large waste is generated and the environment is often polluted and may be left unchecked which can result to many environmental impacts which can have both immediate and long term effect on the surrounding.

Human stampede has known to cause dire consequences across the world (Okoli and Nnorom, 2007). It is often characterized by the surging of individuals in limited space in a crowded situation where response to imminent or perceived danger or loss of physical space causes people to act in an irrational manner. There are majorly three reasons for stampede to occur at a particular place or event which includes gaining competitive advantage, safety, and system failure which are related to the following factors to poor crowd management, poor event management, and improper utilization of space during event. According to (Helbing 2015) is the common misconception that a crowd disaster emanates from a state of panic that is psychological which results to the stampede of people.

Many recent disaster indicators in Nigeria tend to suggest that the pattern of public emergency in a large public gathering is apparently becoming, more or less, a common incident. From between, 2013 and 2016, Nigeria witnessed up to eight major incidents of human stampede with appreciable number of casualties (Okoli, A. C., & Nnorom, K. C. 2007). This incident has led to the acknowledgement of the fact that human stampede is fast becoming a prominent threat to public safety in Nigeria.

The consequences of extreme occurrences like as natural disasters from changes in climate conditions, man's intolerance which breeds violent conducts such as terrorist attacks and the

overuse of public spaces that often lead to overcrowding have raised concerns. There is therefore the need for building design to be associated with safety, security and crowd control. Consequently, it has become apparent and clear that building design needs to broaden its scope on improving safety of occupants especially in places of mass events.

The Concept of Crowd Control

Stampedes from crowd gatherings are not a rare thing in many parts of the world (shukla, 2009). Stampede is a form of man-made (anthropogenic) disaster (Okoli, 2014). It often occurs in crowded environment, mostly in large public gatherings that lack effective space management and crowd control mechanisms. The consequences of stampedes include loss of human life, injury to humans, damage to public facilities, distress and loss of material valuables (Okoli and Nnorom, 2014). The importance placed on the human and material loss in turn may affect the psychological well-being of affected persons and the community at large.

Large gathering of people for various activities or events often comes with many challenges which include that of crowd control, evacuation or exit of people during and after gatherings. Many crowd incidents have been known to have occurred in different types of venues be it religious, civic, cultural events, and in a defining circumstances (Winter, and Fruin, 2002). Crowds found in large religious gatherings mostly consist of people with different range in age gap and their physical well-being is often not the same, even though they are assembled together for a common objective which is to worship. On sensing an imminent risk, individuals in a crowd situation tend to respond in an irrational manner for safety and self-protection losing concern for well-being of others, and the immediate surroundings they found themselves. Thus crowd disturbance continues amongst few individuals who adopt irrational escape strategies to flee away from the situation may in turn disrupt crowd movement and in the process spreads danger or panic. This leads to a situation, whereby as stampede progresses individuals lose their balance, and the crowd takes over which mostly occurs almost immediately.

Architectural elements of crowd control

Human beings are products of their environment. It is one of the generally accepted characteristic of human behaviour which was exploited in the past with both positive and negative intentions. The effects of the built environment especially venues of events for mass public participation, on activity of individuals and their behavior are commonly underestimated (cumming, 2012). In order to create a better environment for public participation, it is very important that the architect understand both the psychological, social, and physical influence regarding the interaction between the people and the built environment.

Hence, it is important for design of space be architecturally efficient so as to help minimize injuries that may occur thereby reducing the time it will take to evacuate people in case of an emergency which makes people to panic (Stills and Bolia, 2015). It is apparent, that panic situations are seldom rare therefore, and the effect of the use of these obstacles needs to be investigated for everyday use in normal situations (Shukla, 2009). The placing of column near an exit improves the flow of people but still we do not see this form of designs in public arena, or near major exits of recent (Shukla, 2009). The reason for this is that these designs may be that of inefficiency of such design in normal situations. The planning and design of architectural features to ease crowd passage is important in the planning of public halls since crowd movement depends on the situations present in the space and where they are located.

The use of suitable obstacles to reduce and minimize clogging of people and improve outflow can be achieved by placing columns at an asymmetrical position in front of an exit door (Shukla, 2009) to improve the flow of pedestrians out of hall of gathering. From their findings, conclusion drawn shows no optimization has been systematically performed in order to get the optimal obstacle designs and location to be placed. This type of designs is still not seen in event halls, or near exits. The reason why this kind of design is not in use or in public event hall is that it may not be efficient in normal circumstances. Therefore, every architectural design forms adopted or to be incorporated in public arenas and event hall needs to be investigated for crowd control whether in panic and normal both normal situations.

Often gatherings whether religious festivals, social events, massive job screening, political events and complex emergency situation are mostly characterized by extremely large pedestrian gatherings. In events of this magnitude, stampedes occurrence is frequent due to

the space people of that magnitude have to contend with (Okoli and Nnorom, 2014). There have been many crowd models in the past that have studied pedestrian crowds' collective behaviours in normal and escape situations that proposed the use of architectural features to direct and control crowds (Sagun and Shukla, 2009). Human behaviour is dynamic and is often influence by the environment. Even though, many studies point to the use of models to know possible behavours inherent in humans, crowd behaviours during large events is still threat to public events.

In public gathering where there is no control, majority of the crowd or population have been known to continue to behave and act in certain ways that may be detrimental to the immediate environment. The increase or growth in the population of people gathering for social good and advancements in the society, calls for the need to check for effects of our population's impact on crowded public functions. However, for crowd control to be effective, one must consider not only the impact of the users of the building, but also how it may impact on the behaviour of people within that built environment (Cumming, 2012). This is the reason that human beings have a way of behaving in crowd and pattern of activity in emergencies can influence the immediate environment.

Recently, with the effects of society's activities which calls for mass gathering for social, civic and religious activities. It has increasingly become important to use architectural design to limit certain crowd behaviours. It is becoming apparently more visible, that there has been an increase in social concern concerning the well-being of people in large gathering due to stampede that is becoming a norm in large gathering in our society today (Okoli and Nnorom, 2014). The behaviour pattern of large population is important as it can impact on mechanical crowd control devices. This makes it importance that building design influences crowd gatherings.

Although buildings spaces and venues of mass public gathering should have certain percentage as capacity that can be inhabited for a particular activity or function, creating an environment for crowd control cannot be overemphasized. Controlling or limiting the behaviour of people that gather for large mass events is not just sufficient, it should be a design that will be able to inspire and impacts positively on environment in a friendly crowd gathering and activities. The understanding of social, physical and psychological impact that an individual experiences in interaction in a crowded environment will help foster design of an environment that challenges the normal and encourages better behaviour of people in large event or gathering even in emergency situations.

Causes of Crowd Disaster

Many disastrous accidents have been known to have occurred in large public mass gathering and events like stampede, injuries and death which results from fire, earthquake, terrorist attacks, and crowd violence. In public buildings, industrial areas and places of large gatherings it causes tragic loss for human and their environments. It is said that, since the birth of buildings, the damage done from both natural and man-made disasters has continued unabated (Pu and Zlatanova, 2005). Currently, complex buildings are designed and being built for civic, social, commercial and religious purposes and are more complex than ever before, hence the potential disasters are also numerous.

According to (William and Stringfield, 1996) disasters that affects crowds in life threatening form can be categorized into this types: the primary disasters includes fire outbreaks, power failure, various forms terrorism such as threat, bombing incidents, and taking of hostages, chemical attack, earthquake, and flood. Secondary disasters include an earthquake which could cause a structural damage from fire, which may in turn lead to a power failure in venue of public assembly thereby causing panic, stampede and death of people. These forms of disasters threat require people inside these buildings to be evacuated as soon as possible. Bearing in mind the complex nature of modern buildings and the large numbers of people that can be inside this buildings use for public events, it is often difficult to plan evacuation of people as tendency to become uncontrollable increases. The need to escape such situation often leads to serious problems such as trampling of people, injuries and even death due inaccessibility of exits.

Many of these accidents that have occurred apparently showed the need for a reliable building structure and designs that support rescue of people during emergency situation as well limit certain behaviour of the crowd. According to (Pu and Zlatanova, 2005), in order to reduce losses in emergencies situation that may arise from occurrences of disasters,

several evacuation procedure have been researched and some of them are widely adopted in architectural designs forming a component building design. The safety of individuals in crowd is an importance aspect to consider in public events. Protecting them from high density crushing during evacuation or exiting is very essential. The various disasters that have happen serves as a warning for underestimating the current challenge when crowd gather at a high density. According to (Still, 2000). The occurrences of crowd disasters show the lack of understanding of crowd and disasters that may occur from poor design, space planning, systemic failure and structural failure.

Space Management

In these days a lot of large complicated architectural and urban spaces have been built all over the world. In the design of public or event spaces for human habitation, it is essential for designers to understand the relation between space and human behaviour.

Architects and designers alike are responsible for ensuring crowd control form an integral part of public building design. (Proulx and Pineau, 1996). In the planning of large public space use for events, it should be establish that the event hall should support movement of people as an important aspect of the venue that should be included in the initial design plan. These may include movement patterns, possible problem areas when large crowd turn out.

In the design of buildings, minimal attention should not be given to the movement of people especially in public buildings. Apart from compliance to building codes which gives guidance in design it does not guarantee that a building will function well during normal public use and when emergency situation arises. Designing for crowd control in public building requires that space allocation to movement and seating areas corresponds with other building entities such as passages, stairs, and other facilities.

METHODOLOGY

In order to identify the vital factors that influence crowd control, a well-structured questionnaire was used to put together the data. The questionnaire was designed to identify factors (such as entry and exits in a building, evacuation or assembly areas) that influence crowd control in large gathering. The questionnaires of (Petty, et al 2004), have been used as the guidelines for structuring research. This type of questioning is adopted in the collection of data that forms the basis for this research. Random sampling method was employed by the researcher for the collection of data. The Statistical package for social sciences (SPSS) is the statistical tool that was used in this study for analysis to ensure accuracy in the findings. The methods that were adopted were used in order to get the right data needed from which conclusion can be drawn.

In likert scale questionnaire, responses are scored along a range which gives respondents up to five options to select the most appropriate answer from the questions. In this scale type questionnaire, respondents can easily identify their level of agreement or disagreement on a range of agree-disagree scale for sets of statements made as questions in order to elicit right responses. Five point scaling used include strongly agree, agree, not sure, disagree and strongly disagree. The targeted population of people for this study is respondents who have encountered crowded situation. However, for effective data gathering many people have been known to attend large gatherings that do not have adequate crowd control mechanism in place, as such data collection instrument used in this study is not restricted to respondents who have encounter crowded situations alone.

RESULTS AND DISCUSSION

Data were obtained questionnaires administered which were duly completed by 219 respondents which is a 76% response rate. It thus represented 72% of population expected.

Many analyses were carried out to determine the significance of the dependent variables. A hypothesis was generated to check the relationship between the research variables and crowd control.

Table 4.1: SPSS Output: Regression Coefficients table

Model		Unstandardized Coefficients		Standardized Coefficients	T	Sig.	95.0% Confidence Interval for B	
		B	Std. Error	Beta			Lower Bound	Upper Bound
1	(Constant)	1.070	.204		5.243	.000	.667	1.472
	have you attended an event where it has been overcrowded	.043	.073	.044	.587	.558	-.102	.188
	crowded public gatherings and events are essentially risk prone	.057	.086	.051	.662	.509	-.112	.226
	have you ever been involved in crowd rush/stampede	.057	.057	.077	1.005	.316	-.055	.169
	threat to public safety/security	.049	.076	.049	.642	.522	-.102	.200
	main cause of overcrowding in the society	.044	.087	.040	.507	.613	-.127	.215
	inappropriate behaviour of people during emergency affects crowd control	-.026	.082	-.027	-.322	.748	-.187	.135
	injuries and death often results from stampede are mainly due to crowd panic	-.051	.077	-.051	-.654	.514	-.203	.102
	most crowd violence result from need to gain competitive edge or advantage of a given situation	.083	.073	.093	1.136	.257	-.061	.226
	panic, anxiety and chaos are manifest of congested public space that leads to pushing which in turn causes trampling	.183	.089	.167	2.053	.041	.007	.358

Source: Author's fieldwork (2016).

The Coefficient table 4.1 shows the significant levels and the coefficient intervals of the variables. The B values show the relationship between all the variables is constant in the model. Using a 0.05 alpha level of significance, there was a significant difference in the influence of crowd, which is represented in the below, Table 4.3. This shows that people consider these factors to influence the control of crowd.

Table 4.2: SPSS ANOVA Output for the influence of crowd behaviour on control

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	15.103	9	1.678	2.234	.021[b]
	Residual	147.232	196	.751		
	Total	162.335	205			

Source: Author's fieldwork (2016).

The correlation between crowd behaviour and control is statistically significant, less (<0.5). The ANOVA table shows that the model has predictive value; therefore it is highly significant (Null hypothesis of no predictive value is rejected).

Therefore, it indicates that a crowded public gathering or assembly that is influence by crowd behaviour which is a threat to safety of people and therefore control of people is essential.

Effectiveness of Crowd Control Technique

Table 4.3: SPSS ANOVA Output for the effectiveness of crowd control technique

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	56.245	5	11.249	9.485	.000[b]
	Residual	237.191	200	1.186		
	Total	293.437	205			

Source: Author's fieldwork (2016).

In analysis of the data, the dependable variable used include do you think the problem of overcrowding and control has been taken care by architectural design of civic centre.

Using a 0.05 alpha level of significance, there was a significant difference between the crowd control technique and the predictors as determined by one-way ANOVA, represented in Table 4.5. This shows that crowd control technique is important in ensuring crowd control.

The correlation between effectiveness of crowd control technique is statistically significant, less (<0.5). Therefore, it indicates that the effectiveness of crowd control influence by crowd behaviour is a threat to safety of people and therefore control of people is essential.

The Coefficient table 4.8 shows the significant levels and the coefficient intervals of the variables. The b values show that there is a relationship between all the variables (constant) in the model.

Table 4.6: SPSS Output: Regression Coefficients

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.	95.0% Confidence Interval for B	
		B	Std. Error	Beta			Lower Bound	Upper Bound
1	(Constant)	-.059	.203		-.289	.773	-.459	.341
	location of stair halls	.304	.058	.348	5.238	.000	.190	.419
	several exit points	.079	.077	.070	1.023	.307	-.073	.230
	crowd behaviour	-.018	.068	-.018	-.268	.789	-.153	.116
	inadequate design of building features	.124	.049	.162	2.505	.013	.026	.221
	stampede which results in emergency situation	.093	.042	.141	2.205	.029	.010	.177
	crowd disaster occurs largely	.035	.052	.046	.671	.503	-.067	.137
	passage ways and open areas help regulate	.136	.077	.114	1.758	.080	-.017	.288
	large foyer and atrium spaces	.095	.065	.095	1.466	.144	-.033	.222
	large aisle and easily accessible seating areas	.132	.060	.144	2.213	.028	.014	.250
	expansive glazing of windows	-.021	.057	-.024	-.373	.709	-.133	.091

The Coefficient table above shows the significant levels and the coefficient intervals of the variables. The b values show that there is a relationship between all the variables (constant) in the model in turn suggests changes in the predictor variable which correspond with changes in the response variable.

Characteristic of Crowd Stampede to Public Safety

Analysis of data was done based on some key parameters (variables) on the effectiveness of crowd control technique such as follows:

1. Human stampede is the cause and effect of public emergency in Nigeria
2. Religious gathering has been the worse hit of human stampede
3. Stampede resulting from mass recruitment exercise is one major cause of injuries and death in Nigeria
4. The vulnerabilities of crowded gathering is on increased due to venue inadequacies

Table 4.7: SPSS ANOVA: characteristics of stampede to public safety

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	53.236	5	10.647	18.685	.000[b]
	Residual	113.968	200	.570		
	Total	167.204	205			

Source: Author's fieldwork (2016).

The correlation between character of crowd stampede and crowd control is statistically significant, less (<0.5). The ANOVA table shows that the model has predictive value; therefore it is highly significant (Null hypothesis of no predictive value is rejected).

Table 4.8: SPSS ANOVA: characteristics of stampede to public safety

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.	95.0% Confidence Interval for B	
		B	Std. Error	Beta			Lower Bound	Upper Bound
1	(Constant)	.371	.171		2.169	.031	.034	.708
	religious gathering has been worse	.170	.047	.238	3.590	.000	.077	.264
	stampede resulting from mass gathering	.100	.057	.110	1.755	.081	-.012	.212
	vulnerability of crowded gathering	.175	.061	.184	2.866	.005	.055	.295
	lack of basic infrastructure and care centres	.084	.055	.100	1.527	.128	-.025	.193
	triggering factors in stampede during religious	.189	.061	.214	3.095	.002	.069	.309

Source: Author's fieldwork (2016).

The coefficient table 4.8, shows that stampede resulting from large crowd gathering are relative significant. The b values show that there is a relationship between all the variables (constant) in the model in turn suggests changes in the predictor variable which correspond with changes in the response variable.

The influence of human behaviour, building shape and the design of building entities or feature are found to be significant as it can both influence the easy movements of people especially toward exits, evacuation and escape of people in an emergency. Also passage ways and open areas were found to be significant as it provides point to regulate the flow of people and break large crowd density. Hence, behaviour is situation dependent that is the behaviour displayed at any point in time is dependent on the current situation and internal state of the individuals in crowd concerned.

CONCLUSION

The overriding purpose of this study is to identify safety crowd control measures that will aid the control of large crowd turn out in places of events and large public assembly to control or limit crowd behaviour. From the analysis of result carried out, it shows that crowded public gathering are risk prone and stampede as example of crowd disaster is the most common occurrences in among the various crowd incidence. As such, it is highly significant that is stampede should be controlled or mitigated in places of large public gathering. Mass political and social events were found to have the highest form of crowd incidence; the results of the analysis shows that many people have been involved in crowd rush and stampede more than any event. This is as a result of large public interest and participation in events of that nature. People of various age and size are involved in such gathering leading to inappropriate behaviours which then affects the emergency measures put in place thereby affecting the control of crowd.

It was found out that injuries and deaths results more from panic, and in competing to gain an advantage in crowded situation. It is a manifest of a congested public space which leads to pushing and in turn causes trampling and stampedes. As such it is highly significant that public spaces are given attention in number of attendance in event compare with capacity of event hall.

Consequently, from analysis it is also found out that the use of barriers to separates or direct crowd is ineffective with large crowd of people and that putting barriers with large crowd of people creates problems as such it is highly insignificant in the control of crowd in places of event and public assemblies. It also shows that the problems of crowd control have not been taken care of by building design as such it can be said that zoning of pedestrian areas from seating and standing sections affects the evacuation of people. Thus, it is highly significant that it is building design should be considered as an integral part of crowd control.

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IMPACTS OF THERAPEUTIC ENVIRONMENTS ON THE RECOVERY PROCESS OF PATIENTS IN HEALTHCARE FACILITIES IN NIGERIA

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The characteristics of the physical environment in which an ill person receives care can greatly affect the safety, satisfaction and final outcome of such a person. It is therefore important that individuals of all ages and races, who are recuperating from illnesses, be kept in conducive therapeutic environments that will support the healing process. Therapeutic environments are necessary and can be embedded using therapeutic elements into hospitals, clinics, day-care centres, and other healthcare facilities. This research focuses on the impacts of therapeutic environments on the recovery process of an ailing individual. This was carried out by visiting healthcare facilities within the Federal Capital Territory to administer structured questionnaires on patients, staff and caregivers. The end results were then analysed and discussed. A conclusion was therefore arrived at that for an ill individual to recover adequately and quickly, they must be provided with certain therapeutic elements to aid healing.

Keywords: Conducive, Environment, Healthcare, Recuperating, Therapeutic.

INTRODUCTION

A therapeutic environment is an environment or space that supports patients, as well as care givers of such patients, from the initial stage of the illness, through the healing and recovery stages of such a patient. Therapeutic environments are most times used in hospitals and health care facilities, due to the fact that they are the places where patients can be found (Daykin, 2006). Therapeutic environments are responsible for ensuring that patients recover completely in an environment in which they derive maximum comfort from. They are being used by persons of all ages, children and adults alike (Codinhoto, 2009).

Healthcare facilities are expected to be designed in such a manner that they not only facilitate and support modern healthcare medicine and technology, patient care and safety but as well encompass the patient and caregivers in a therapeutic environment. A research paper by Watkins (2010) reinstated that 'the characteristics of the physical environment in which a patient receives care affects the patient's outcome, safety, satisfaction, staff efficiency and general hospital organisational outcomes. It is worthy to note that an environment can never be neutral. It must either have positive or negative impacts on the humans in it.

When humans walk into a hospital environment, away from their homes, which is well known to them and friendly, to a new environment which they consider unknown and therefore, unfriendly, they are introduced to foreign objects and different people potentially causing considerable fear and anxiety, and as a result, they consider the hospital environment threatening, which may result in them developing extra trauma and stress during hospitalisation or medical appointments (Said, 2006)

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Jean (2009) declared that 'hospitals with therapeutic elements are usually better choices for the treatment of patients, especially in the treatment of rare infections that may be fatal or severely detrimental to their lives. Hospitals that incorporate therapeutic elements ensure not only with the psychical wellbeing of the human, they as well ensure the mental and psychological growth and development of that patient. This is made possible by the services of counsellors who assist in the healing process by ensuring that the nothing physiological is hindering their recovery (Routhieaux, 1999).

Humans are delicate creatures. It is a normal process of life for humans to fall ill from time to time, and as such require medical attention. A health care facility whose environment will aid the healing process of humans is a necessity in a country such as Nigeria, the largest country in Africa in terms of population (Clarkson, 2004).The aim of this study is to evaluate the impacts of a consciously planned environment of a healthcare facility on the healing process of humans, and evaluate how therapeutic environments genuinely impact general clinical outcome.

The objectives include identifying therapeutic elements, evaluating the positive or negative impacts of therapeutic environments on the recovery process of an unwell patient, examining existing therapeutic environments in healthcare facilities, and identifing practical measures of incorporating therapeutic environments in healthcare facility designs.

It is a necessity for the government of every country to give her citizens the best in terms of healthcare and basic amenities. It is important that a healthcare facility is established to meet the unique healthcare needs of humans, in an environment that will speedily ensure that at the shortest possible time, they are healed from their illnesses. It is also important that while these patients are in the hospital environment, they are maximally comfortable and satisfied. It is in light of this that a research of this magnitude is necessary.

The major limitation encountered in the course of this research is the unavailability of healthcare facilities with therapeutic environments in and around the country, Nigeria. While most federal and state government owned hospitals have few therapeutic elements, there is no single standing healthcare facility that has been consciously planned to incorporate healing environments. This stood as a limitation while case studies were being carried out.

Overview of Modern Healthcare Facilities

A hospital is a health care facility or institution that provides treatment to ailing patients with a team of specialised staff and equipment. In ancient times, religion was often linked with medicines. Several religious homes and practitioners were known for the treatment of ailment. One of such was the ancient Egyptian and Greece temples. The temples were dedicated to healer gods and functioned as medical centres for medical advice and healing. When people came to such temples with illnesses, they most often were healed. Till now , in the Greece Temple, three large marble boards exist, which have the names, complaints and cures of patients being healed of illnesses in the temple. In China, the shrines dedicated to their healer god were also known to provide healing, as well as food for the hungry. In Europe, where Christianity was the prominent religion, priests and nuns in the Catholic Church were also known to take care of the sick and heal ailments.

India was however, the first part of the world to delve into modern healthcare, this was done between 100BCE and CE150 in Sanskrit Carakasamhita by the building and equipping of the first hospital, called Mihintale hospital. It was formerly a lying-in home for the sick, but was later converted to a hospital. Tumrah (2003).

In the 19th century, hospitals however became more professionalised and hospital management administration, properly organised. An Apothecaries Act was passed in 1815 which stated that medical personnel receive training in institutions and practice for a minimum of six months in hospitals before being certified medical practitioners. The first hospital to be established after this act was the Charing Cross Hospital which was set up in 1818 in West London by Dr. Benjamin Golding. Nursing schools were established after this for caretakers in the medical field. These used to be nuns whose jobs were to assist the medical doctors. Professionalism was then attached to the medical profession by the establishment of Charing Heart nursing school with the mission of training nurses to work in healthcare facilities, to work with the poor and vulnerable. After the First World War, in 1922, the government began issuing a national diploma for nursing (Daykin Brrne 2006).

A body called the National Health Services was established in1948 to oversee healthcare providers and control the affairs of all hospitals in the world. Two different types of patients

exist in a hospital environment. The first are those who go for diagnosis and treatment or therapy and leave the hospital premises the same day. They are called outpatients. Inpatients on the other hand, are those who are admitted and required to stay for a number of days, months or even years, depending on the nature of their illnesses. (Lamar 2004)

The major difference between a hospital and other healthcare facilities is the ability of hospitals to admit patients and provide adequate care for them. All other types of healthcare facility do not have this ability and are therefore called clinics.

Types of Healthcare Facilities

Healthcare facilities are categorised according to the nature of services they provide to the public. (Agency for Healthcare Research and Quality 2011). The different types of healthcare facilities are listed below:

1. **Hospital**

   A hospital is a healthcare facility that is established to cater for and provide healthcare to patients with every kind of diseases and illness. A hospital usually consists of an emergency department that caters for immediate needs before the patients are distributed into their corresponding units. A hospital has all units in the medical field, being headed by various consultants in the fields. They are usually government owned and very enormous. The types of hospitals include general hospitals, district hospitals, teaching and specialised hospitals.

2. **Clinic**

   A clinic is similar to a hospital. It is however much smaller than a typical hospital. Clinics are built to respond to the immediate health needs of school, offices, camps and institutions. Cases that are too complex to be attended to in a clinic are readily transferred to the nearest hospital after first aid treatment has been administered.

3. **Dispensary**

   A dispensary is a healthcare facility constructed primarily for the distribution of drugs, medicines, injections and medical fluids. A patient is administered drugs after presenting a prescription from a doctor.

4. **Pharmacy**

   A pharmacy is similar to a dispensary in the sense that the primary aim of a pharmacy is as well, to dispense drugs. However, in a pharmacy, a pharmacist is present to give drug advises. Most pharmacies are situated within or around a hospital premises.

5. **Medical Laboratory**

   A medical laboratory is a healthcare facility where samples of blood, fluids and cells of patients are being collected and tested. A medical laboratory specialist mans a medical lab and is assisted by bio-chemist and laboratory attendants.

6. **Day-care Centre**

   A day care facility is one that caters for children below the ages of 3, while their parents or wards are at work. A doctor and 2-3 nurses, depending on the size of the centre are usually attached to every day-care in case of emergencies.

Therapeutic Environmental Theory

Therapeutic environmental theory is one that takes its root from the field of environmental psychology (which encompasses the study of the physiological and social effects of the environment), psychoneuroimmunology (which involves the effects of the environment of the human immune system) and lastly, neuroarchitecure (the study of the ways by which the brain perceives/ interprets architecture). Watkins (2008).

It is common knowledge that when patients are admitted in a hospital, they begin to entertain fears, and uncertainty, as related to their health, safety and isolation from the rest of the world and their social relationships outside the four walls of the hospital building. The same applies to children. From studies carried out by Tumrah (2003), ‘children being admitted in healthcare facilities have a higher tendency to suffer suppressed immune disorders, thereby dampening the child’s emotional and social resources, and finally, resulting in an impediment of recovery and healing’.

In the design of a paediatric facility therefore the key factors to be considered, according to Nicholas Watkins, after thorough research, include the reduction or total elimination of environmental stressors, provision of positive distractions for each age bracket amongst the children and adolescents, enable social support and finally, give the patients a sense of control.

Therapeutic Environment

A therapeutic environment as the name implies describes a space or spaces that support patient and their care givers through hospitalisation and recovery processes. Stichler, J.F (2001) defines the therapeutic environment as 'a physical setting that supports a hospitalised individual through the various stresses being imposed on such one by illnesses, hospitalisation and sometimes, bereavement'. This implies that the environment in which an ill individual is can indeed make a difference in how quickly the individual recovers from or adapts to the illness in cases of chronic condition.

A therapeutic environment must be one that must support persons throughout the period in which it is needed. This therefore means that when one is in such an environment, there must be an obvious recovery or adaptation, as the case may be, at the earliest time possible.

Goal of Therapeutic Environments

Every therapeutic environment must be created in such a way that it is aimed at engaging ailing patients in a process of progressive healing and spiritual maturity. The environments must be such that will consciously reduce or totally eliminate the stress of individuals. It is on this note that Malkin, (2011) gave the physical setting of a therapeutic environment to have the following characteristic as listed below:

1. The environment must be one that will jettison some basic environmental sensors such as glare, noise, lack of privacy and unhealthy air quality.
2. The environment must be one that must connect the ailing patients to nature by means of creating a view to the outside. This can be done by integrating interior gardens, water elements and aquariums.
3. The environment must offer choices to make the patients feel like they have a certain level of control of their immediate environment. This includes the level of lighting and type of music being listened to.
4. The environment must be one that should support social integration. This includes seating arrangement or if possible, accommodation for sleep over loved ones, friends and family members.
5. A therapeutic environment must provide some positive forms of distraction for the patient. This includes art, internet connections and access to special television programmes the patient enjoyed before falling ill.
6. A therapeutic environment must be one that has a feel of absolute peace, reflection, total peace and spirituality.
7. Finally, a therapeutic environment must be one that creates opportunities for relaxation, rest and humour.

Therapeutic Environments in Healthcare Facilities

Therapeutic environments can also be referred to as healing environments. They can be physical spaces different from the hospital, and can also be spaces in the hospital. For the purpose of this research however, the therapeutic environments will researched on, in connection with hospitals. This therefore implies that every part of the design will promote the healing process of an ailing human.

What Makes A Hospital Environment Therapeutic?

Hospital data being compiled between the year 2003-2011 by the Agency for Healthcare Research and Quality (AHRQ) studied trends in hospital costs, hospital utilisation, hospital recovery process and therapeutic environments. They therefore came up with the conclusion that 'a hospital or healthcare facility can only considered therapeutic if the design supports clinical excellence in the treatment of the physical body, if it supports the physiological, as well as social and spiritual needs of the patient, the care givers and the staff of the facility. Finally, such a facility must produce measurable evident positive effects on the patient's

clinical outcome and the effectiveness of the care givers. If a design lacks one or more of the above stated, it cannot be said to be therapeutic'. AIA Academy of Architecture for Health (2010).

Basic Constituents of Therapeutic Environments in Hospitals

In therapeutic environments, there are three basic constituents, without which am environment cannot attain therapeutic abilities. They are light, sound and landscape.

In view of the above named constituents, paediatric hospitals, according to Ulrich et al (2008), must have the below listed properties to create and maintain a therapeutic environment for the patients, relatives, staff and users of the facility. In no particular order, they are:-

1. Adequate lighting and ventilation of wards.
2. Increased safety and security.
3. Reduced patient falls.
4. Reduced infection rates.
5. Improved indoor quality.
6. Enhanced patient control.
7. Privacy.
8. Maximum comfort.
9. Paediatric, aesthetically pleasing materials.
10. Art.
11. Visual comfort.
12. Acoustic comfort.
13. Organisation and functionality

Merits of Therapeutic Environments

Therapeutic environments, apart from their capacity to enhance speedy recovery, have several other benefits. They are:

1. Harmonious relationship enhancements between patients.
2. Confidence building in patients.
3. Leadership skills development in patients.
4. General wellbeing of patients.
5. Improved quality of interior spaces.
6. Reduction of anxiety and stress in patients.
7. Provision of positive distraction.
8. Improved sense of control and fast discharge rate.

RESEARCH METHOD

This research will be carried out using the primary and secondary methods of data collection. Primary data will be gathered by way of personal visitation to existing healthcare facilities and one-on-one interviews of the staff and users of such facilities. Questionnaires were administered to users of healthcare facilities to ascertain their level of understanding of therapeutic environments and the benefits they have received from these environments. Secondary data on the other hand, will be amassed by the careful study of past relevant literature on the subject matter, as well as surfing the internet for journals, webpages and e-books relating to the matter being researched on. Case studies were carried out on exiting healthcare facilities within and outside the country, which were analysed. The data obtained was analysed using likert scale and the mean was obtained to determine the importance of the variables.

Table 1.1 **Number of Respondents Per Opinions of Adequacy of Therapeutic Elements**

S/N	Variable To Considered	Checklist				
		Very Adequate (1)	Adequate (2)	Very Inadequate (3)	Inadequate (4)	Total
1.	Therapeutic landscape	5	18	44	20	87
2.	Natural/artificial lighting in wards	19	39	27	12	97
3.	Natural therapeutic elements	0	3	75	12	90
4.	Passive therapeutic elements	4	6	81	9	100
5.	Interactive seating arrangements	51	31	9	0	91
6.	Active care considerations	18	13	34	35	100
7.	Passive care considerations	6	12	33	45	96

RESULTS AND DISCUSSIONS

Data in the table above shows the gender and age of the respondents. The table further reinstates that 68% of respondents were female, indicating that more females visit healthcare facilities on an average. The table further indicates that over 60% of respondents were below the age of 20. Indicating that more children and adolescents visit healthcare facilities than other age groups. It also indicates that 80% of respondents who are care takers of patients are female and are above 50. This therefore means that care for hospital patients are usually left for the elderly in the society, probably because they have more time on their hands than other age groups of the younger generation who have to work long hours to make ends meet.

Table 1.2 Questionnaire Respondents Data

Characteristics Of Respondent	Frequency
Gender:	
Male	32
Female	68
Class of Respondents:	
Patient	33
Care Taker	44
Staff	23
Age:	
0-20	46
21-40	27
41-60	18
61-80	9
Above 80	0
Therapeutic Elements in Use:	
Light	27
Sound	4
Landscape	69

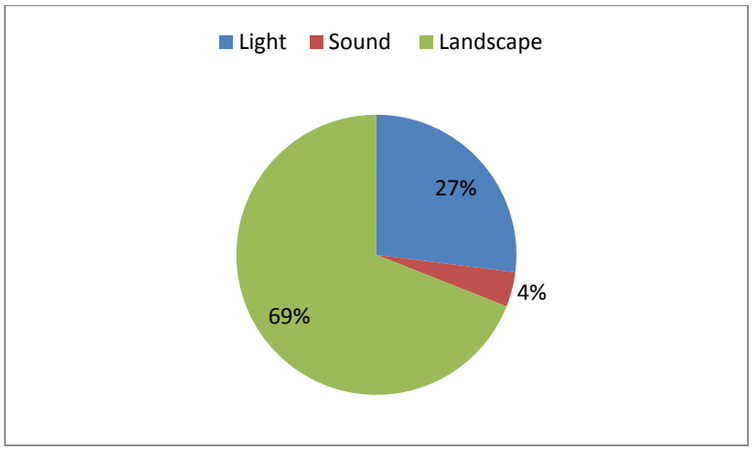

Figure 1: Therapeutic Elements Used in Healthcare Facilities Studied

The table finally indicates that 69% of hospitals use landscape as their only therapeutic element, which is insufficient as according to studies, the three elements i.e. light, sound and landscape must be present and active for therapeutic benefits to be obtained in that facility.

The second section of the questionnaire attempted to identify the perspective of users of the healthcare facilities under review, in terms of the lighting quality in the wards of the healthcare facility, the landscape quality and the interactive seating arrangements in the reception and waiting rooms in the healthcare facility. The results are as shown in table 1.3 below:

Table 1.3 Adequacies of Therapeutic Elements in Healthcare Faculties Studied

S/N	Variable	Adequate (1)	Partially Adequate (2)	Inadequate (3)	Total
1.	Natural lighting in the hospital wards	5	5	12	22
2..	Artificial lighting in the hospital wards	49	20	1	62
3.	Soft landscaping in the hospital environment	13	10	12	35
4.	Hard landscaping in the hospital environment	1	9	11	21
5.	Interactive seating arrangement in the reception and waiting rooms.	31	40	3	73

From the table above, it can be seen that more than 50% of the respondents agree that their wards have adequate natural and artificial lighting necessary for the recuperation of patients. It is also evident that more than half of the respondents also agree to have adequate hard and soft landscape elements. Rather unfortunately is the fact that less than 50% of respondents have identified that in their healthcare facilities, there are no interactive seating arrangements in the common areas such as the waiting rooms and reception.

Table 1.4 Sum of Respondents Responses on Adequacies of Therapeutic Elements in Healthcare Faculties Studied

S/N	Variable	Adequate (X1)	Partially Adequate (X2)	Inadequate (X3)	Total
1.	Natural lighting in the hospital wards	34	63	3	100
2..	Artificial lighting in the hospital wards	22	47	31	100
3.	Soft landscaping in the hospital environment	67	21	12	100
4.	Hard landscaping in the hospital environment	32	54	14	100
5.	Interactive seating arrangement in the reception and waiting rooms.	21	20	59	100

The interpretation of the results obtained based on the Likert scale calculation is based on the following range scale:

1.0 - 1.49 Very Adequate

1.5 - 2.49 Adequate

2.5 - 3.49 Inadequate

> 3.5 Very Inadequate

The mean value was obtained for each variable to ascertain the level of adequacy or inadequacy of same according to the respondents.

Table 1.5 Respondents Responses on Adequacies of Therapeutic Elements in Healthcare Faculties Studied Interpretation

S/N	Measured Variable	Sum	Mean	Interpretation
1.	Natural lighting in the hospital wards	100	4.54545	Very Inadequate
2..	Artificial lighting in the hospital wards	100	1.61290	Adequate
3.	Soft landscaping in the hospital environment	100	2.85714	Inadequate
4.	Hard landscaping in the hospital environment	100	4.76190	Very Inadequate
5.	Interactive seating arrangement in the reception and waiting rooms.	100	1.36986	Very Adequate

Table 1.6 Effects of Therapeutic Environments on Respondents

Questionnaire Indicator	Strongly Agree (1)	Agree (2)	Disagree (3)	Strongly Disagree (4)	Undecided (5)
Light as a therapeutic element important in healthcare facilities	12	42	32	8	6
Sound as a therapeutic element important in healthcare facilities	19	40	27	8	6
Landscape as a therapeutic element important in healthcare facilities	41	28	31	11	4
The presence of light in a healthcare facility aids healing	50	42	5	1	2
The presence of sound in a healthcare facility aids healing	54	40	9	4	0
The presence of landscape in a healthcare facility aids healing	43	51	3	0	5
Every healthcare facility should have therapeutic environments embedded in their designs	24	62	14	0	0
My family and I feel more comfortable in hospitals that have more than one therapeutic element	56	32	12	0	0

From the above table, it is evident that users of healthcare facilities require that therapeutic elements be included during the design and in the use of these facilities. Therapeutic elements must therefore be included in hospital designs to ensure maximum conformability for patients, care takers of patients and staff of these healthcare facilities.

CONCLUSION

The need for healthcare facilities to imbibe therapeutic elements cannot be overstressed. It is therefore important that the federal government of Nigeria clearly instructs existing healthcare facilities to imbibe this concept, and ensure that healthcare facilities to be built use this concept of ensuring that therapeutic elements are being installed into healthcare facilities even before building approval is granted them.

In light of the literature review, date obtained and analysed, and conclusions drawn from the analysed data, the following recommendations are being made.

1. That natural lighting be made adequate in wards. This can be achieved by providing windows and doors of at least 1500mm width at intervals of 3m maximum to ensure that in the daytime, natural light is given access into the wards.
2. The issue raised in (1) above can as well be achieved by the provision of courtyards within the interior of the healthcare facility and ensuring that the wards are placed in positions where the daylight gotten from the courtyards comes into the wards with little or no obstruction.

3. That artificial lighting necessary for recuperation of ailing patients be also made available. This can be achieved by installing incandescent white light bulbs in the interior of hospital wards. This helps to illuminate the interior space especially at night, and as well provide warmth to counter the harsh coldness being experienced at night.
4. That landscape is made an integral part of the healthcare facility building. This involves both hard and soft landscape. Hard landscape can be incorporated into the facility by installing paving, walkways and outdoor seats within the environs of the healthcare facility.
5. The soft landscape can be incorporated into the facility by planting plants and trees that aid healing and relaxation. The services of a landscape architect may be sought in this regard. The plantings can be made outside, as well as within the facility, in an open space such as the courtyard and porches.
6. Finally, interactive seating arrangements should be encouraged within the receptions and waiting areas in healthcare facilities. This helps in quickening the healing proves when the patients and caregivers can interact with one another and act friendly and concerned towards their fellow patient. This can be achieved by installing furniture that require the people seating to seat facing each other.

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ASSESSMENT OF COURTYARD FUNCTIONS AND ITS DESIGN CONSIDERATIONS IN HOSPITALS IN NIGER STATE

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Healthy living is an affordable luxury within individual reach stemming from the macro level of a hygienic environment to the micro level of available healthcare. The indoor and outdoor environments simultaneously work to enhance patients healing process in healthcare facilities. Although enclosed, a courtyard is an architectural design component strategically positioned to connect indoor spaces with the external environment. Often times, courtyards are landscaped to further serve as recreation/relaxation spaces among several other functions. This study worked towards determining the functions of courtyards and discussed its design considerations with regards to hospital design. It further highlights the relationship between courtyard design and patients' health in terms of safety and recovery. Using a descriptive research method, this study employed the use of observation schedules and photographs in data collection from the field. The data obtained was analysed and chats were used to show the results that were discussed extensively. Existing literature on courtyards was also reviewed concisely and the disparities between existing concepts was identified. The result revealed that courtyards in most of the hospitals in Niger state were not creatively designed to help harness its full potentials. In conclusion, the research outlined various means to optimise courtyard microclimatic and therapeutic potentials and recommended sustainable functions to be incorporated within the courtyard space as a means to aid patient's recovery.

Keywords: courtyard, design considerations, environment, hospital, sustainability.

INTRODUCTION

The affinity for nature and its elements is one of the numerous desires of humans. The flow of outdoor environment which is often natural into enclosed indoor spaces requires the integration of the former into the later through the use of certain elements. Courtyards are one of such elements. Courtyards are architectural elements which emanated from dry and hot climatic regions of the earth, and have since been adopted in other climatic regions (Edwards, Sibley, Hakmi & Land, 2006). According to Abbas, Ismail & Solla (2016), courtyards are defined as enclosed outdoor spaces surrounded by building components and are open to climatic elements at the top. In spite of the adoption of courtyards in all climatic regions, they have design considerations and configurations that are unique to the climatic regions where they are used due to the differences in social, cultural and climatic characteristics. (Abdulbasit, Norhati, Sabarinah & Josmin, 2013). Similarly, Reynolds (2002) and Berkovic, Yezioro, & Bitan (2012), averred that the area, height, orientation, building elements around courtyards and the nature of opening at the top are designed to respond to the human requirements for comfort in the buildings. Therefore, adopting designs that are completely indigenous and already modified to suit certain regions or culture to other climatic regions and cultures may not be absolutely functional (Markus, 2016)

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Mamud & Yelwa (2018). **ASSESSMENT OF COURTYARD FUNCTIONS AND ITS DESIGN CONSIDERATIONS IN HOSPITALS IN NIGER STATE.** Contemporary Issues and Sustainable Practices in the Built Environment. School of Environmental Technology Conference, SETIC, 2018

According to Han (2010) and Berman, Jonides & Kaplan (2008), contact with natural environment improves health recovery and performance of the human body among other benefits. Thus, the design of courtyards is linked to certain medical improvements through therapeutic treatment as they allow the integration of nature into buildings. This paper aims to assess courtyards in hospitals in Niger

State with focus on two aspects which are: the functions of courtyards and their design considerations in relation to recovery and performance of the health of patients.

Courtyard Functions

The courtyard has several benefits to humans and buildings. These benefits encompasses: Architectural, climatic, cultural, economic and social benefits. The benefits are linked to the functions they perform (Abdulbasit, et al., 2013). Agreed equally, Meir (2000) opined that being an open space within a building which are often outdoor, they generally perform functions which ranges from leisure, social and micro-climate. Courtyards are primarily common to homes for many years, this makes them to perform several functions as required by the occupants. Their functions are not limited to; working, cooking, gardening, relaxation and sleeping (Edwards et al., 2006). Courtyards are enclosed mostly by walkways, colonnades, pavements and walls, thus enables landscape elements like water bodies, plants, lights and shades that plays important roles in human existence to be integrated within them. Since courtyards allow the natural environment into buildings, they at the same time offer acoustic and visual protection. They also should be made to provide a high level of thermal comfort (Meir, 2000). Rust (2010) also agreed that building designs incorporating courtyards could help induce the positive effects of natural elements by introducing them within courtyards. Rajapaksha, Nagai & Okumiya, (2003) also stated that natural ventilation of high-rise buildings can be achieved by introducing courtyards in the center of the building.

Antonio & Carvalho (2015) stated that courtyard can be used to stimulate healing processes and contribute substantially by modifying the climatic condition of a space thereby enhancing the mental and physiological sensation of the users, due to the natural healing components of the natural environment. Han (2010) and Berman, Jonides & Kaplan (2008) equally agreed to the position. In a study of Hong Kong University campus courtyards by Lau & Yang (2009), results showed that courtyards having gardens stimulate social support, physiological ambience and gave a sense of control and privacy. The study also stated that the experiences of users such as visual connection between indoor and outdoor spaces, security among others were enhanced through the introduction of courtyards. Making different courtyards to have themes that create different emotions based on design requirements were also recommended in the study. Toone (2008), examined the effect of healing garden use on stress experienced by parents of patients in a paediatric hospital. Results showed that there was a decline in stress level when parents and paediatric patients were in a healing garden courtyard than when they were within interior space.

Nature Integration in Designs

According to Heerwagen (2009), the integration of elements of nature into buildings resolves mental health which in turn has an effect on the overall health of patients and care-givers alike. For example, the rhythmic movement of grasses and trees are movement styles that are related to tranquillity which supports the development of a relaxed and stable mind which could encourage the recovery of patients. Fuller, Irvine, Devine-Wright, Warren & Gaston (2007) explained that people who go out to parks with more natural elements performed higher with their wellbeing compared to others. Researches prove that natural environment stimulates positive emotions that encourage recovery from certain ailments. One of those researches carried out by Berman, Jonides & Kaplan (2008), stated that the Attention Recovery Theory (ART) proposed that specific environments help people recover from ailments by serving as restorative elements. This occurs by permitting and allowing the mind to be renewed, which makes natural environment to be effective as restorative environment.

Design Variables

The classification of courtyards comes in different outlooks. One of such is the design forms, which sometimes could be the number of enclosure around them. According to Meir, Pearlmutter & Etzion (1995), there are basically three (3) types of courtyard enclosure which includes, fully enclosed with four-sided enclosure, semi-enclosed with three-sided enclosure or even two-sided enclosure. Another classification is the plan shapes of courtyards. According to Das (2006) and Reynolds (2002), there are several shapes of courtyard which are basically regular plane shapes that are rectangles, squares, circular, and oval among others. These shapes have been further modified to accommodate needs which are usually spatial functions, site restrictions and design needs. The modified shapes are: U-shape, L-Shape, T-shape or Y-shape.

Several studies carried out based on the design shapes of courtyards showed that the shapes of the courtyard space have an effect on the micro-climate within the building, this is because the designs in a way modifies the micro-climate of the environment. (Abdulbasit et al, 2013). According to Aldawoud, (2008) and Tablada, Blocken, Carmeliet, De Troyer& Verschure (2005), design shapes and their environment should be protected from solar radiation and hot dusty wind while cross ventilation should be considered as they affect the thermal comfort of indoor space. In another study carried out on three-sided enclosed courtyards by Mier et al (1995), results show that when there is better ventilation, volume of space and better orientation of courtyards, a better micro-climate can be achieved within the courtyards and indoor spaces.

Muhaisen and Gadi (2006) equally studied how rectangular shape plan courtyards perform in terms of height and size in different climatic zones. Results showed that the optimum height for courtyards to get a reasonable effect of shading performance based on sun location and exposure of courtyards to sun is three storeys in hot humid climates; two storeys for hot and dry temperate climates and one storey for cold climates. It entails that taller walls around courtyards should be considered in hotter climates and lower walls should surround courtyards in colder regions. Also, the result showed that deep courtyards allow more interior shadow in summer while shallow courtyards perform optimally in winter. This however does not hold for daylight. Muhaisen and Gadi (2006) then concluded that geometry of courtyard plans and the proportion of height and size of the courtyard have an influence on the shading performance of the indoor spaces while taking into perception the location of the sun. When narrow courtyards are less exposed to solar radiation, they have the potentials to be used for passive cooling (Rajapaksha, Nagai & Okumiya, 2003). Courtyards with high walls will cause lower air temperature within courtyards and surrounding interior spaces. However, if the high walls are enclosed without openings into the interiors, air flow into interior spaces would be hampered (Antonio & Carvalho, 2015). On courtyard orientation, Abdulbasit et al, (2013) stated that there is a general notion that courtyards with their elongation in the north-south direction are the best option for optimum performance.

Courtyard Enclosure

Courtyard enclosure refers to building components that form and border courtyards within buildings. The enclosure components are walls, doors and windows (Abdulbasit et al, 2013). Arcades, colonnades, pavements among others are also enclosure components (Mier, 2000). The components enclosing courtyards play key roles in determining the micro-climate settings such as natural ventilation, day-lighting and thermal comfort within interior spaces by influencing the opening to wall ratio, nature of materials among other variables (Abdulbasit et al, 2013).

An investigation by Al-Hemiddi and Megren (2001) on the effect of ventilated courtyards on the thermal performance of a house in two different conditions of closed and opened windows in courtyards reviewed that the one with closed windows in courtyards had an inconsequential cooling within the interiors while the other with opened windows into the courtyard was substantially cooled due to natural air flow from the courtyard into the interiors.

RESEARCH METHOD

Niger State has twenty-five (25) local governments which is regioned in to three (3) Geo-political zones (A, B and C) three (3) hospitals were selected each from 3 different local government in each zone which summed up to give nine Local Government Areas that makes up the sample population for the study. These Local Government Areas includes: Bida, Agaie, Lapai, Chanchanga, Wushishi, Kotongora, Magama, Paikoro, Shiroro. Nine hospitals were selected, using stratified random sampling technique. This paper used a Descriptive Research Method. Primary data were collected from field using observation schedules and photographs which contained variables that are focused on courtyard functions, configuration, forms, courtyard orientation, heights and landscape elements. The data collected were analysed and charts were obtained using Microsoft Excel.

FINDINGS AND DISCUSSION OF RESULTS

While there are checklists-design variants-that needed to be considered in the process of designing buildings, those of courtyards needs to be put into consideration as regarding designs of hospital as well. Observations made in the course of this study revealed that courtyards perform basically four functions in most hospitals in Niger State, which include lighting and ventilations, circulation, recreation and for therapeutic functions, however most of the courtyards were not designed to help harness the full potentials of the courtyard functions. An example is the case of courtyards in General hospital, Bida which function minimally for day-lighting, cross ventilation and recreation as shown in Plate 1. The paving material, being concrete used within the courtyard can cause thermal discomfort as it will help in solar and thermal radiation into the surrounding interiors. In plate 2, another courtyard in General hospital, Bida is completely closed and does not allow for integrations of some functions. Plate 3 shows another courtyard in General hospital, Bida that is open and can be landscaped to help serve therapeutic function but shall be designed not to accommodate treatments functions. Courtyards of such are also used for other functions around the hospital.

Plate 1: Minimal nature in courtyard

Plate 2: Inaccessible courtyard in Bida

Plate 4 shows that, a courtyard of General hospital, Kotongora, was landscaped but not maintained. If considered, it could be used for a healing or meditation garden. However, the courtyard enhances ventilation and day-lighting but was not accessible by the virtue of the short walls surrounding the courtyard.

Plate 3: Bare courtyard in Bida hospital

Plate 4: Courtyard Kotongora hospital

In plate 5, a courtyard in Lapai General Hospital presents a situation where grasses were growing wild without maintenance while plate 6 shows a bare courtyard in Agaie General Hospital.

Plate 5: Courtyard Lapai hospital

Plate 6: Bare courtyard in Agaie hospital

The situation in most of these hospitals showed that despite the several advantageous functions courtyards could be used for, they were however under-utilised. Contrarily, the cases of some hospitals were however different in the way courtyards were put to good use like that of Minna General Hospital where there was a conscious design effort in optimizing the use of courtyards serving as a sit-out, walk way, garden and providing an optimum micro-climate as shown in plate 7 and plate 8 in the case of Nasko hospital.

Plate 7: Minna General Hospital Courtyard

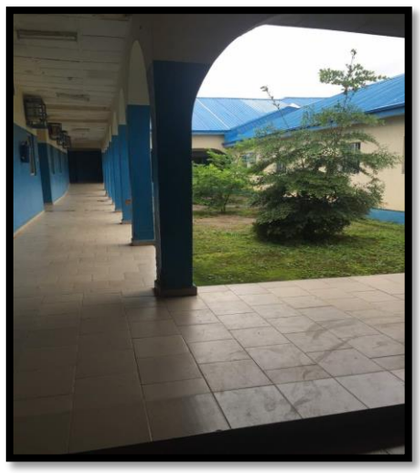

Plate 6: Courtyard Nasko hospital

Figure 1 shows the common usage of courtyards in General hospitals in the study area. Out of the observed courtyards, 16% are used for recreation, 47% for ventilation and lightening, 21% have walkways and pavements used for circulation and connectivity, and 16% for healing and meditation. It implied that majority of courtyards were designed to allow ventilation and natural lighting into the interior spaces. It was observed that courtyards have different uses in General hospitals, while some were even used for functions outside what it was actually designed for. In the nine (9) General hospitals that were visited, observations showed that courtyards have four (4) key functions. As shown in figure 1, there utilisation includes: recreation, circulation and connectivity, ventilation and lightning and healing and meditation. In some cases, courtyards in some of the hospitals perform almost all the four key functions.

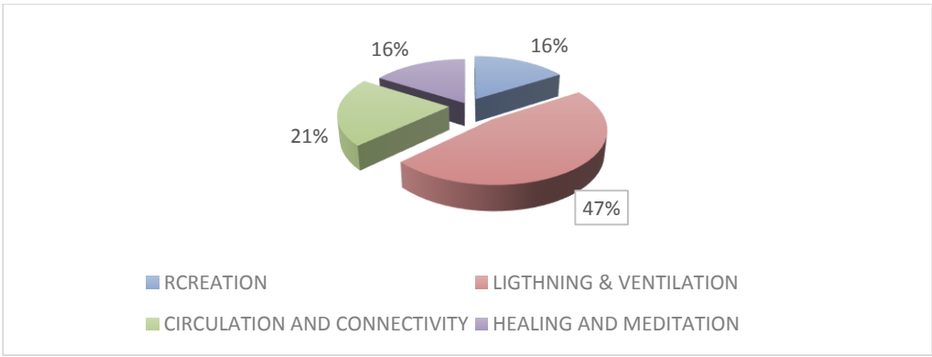

Figure 1: Courtyard Usage Source: Field Work (2017)

Figure 2 shows the configuration of courtyards common to the General hospitals sampled. There are different types of courtyard configuration which were discovered in the course of field work. They are classified as: cluster courtyard, open courtyard, complex courtyard and closed courtyard. The cluster courtyards are either multiple courtyard or spinal courtyard. Analyses showed that 12% are clustered courtyards 29% are fully closed, 47% are opened and 12% also area interlinked. It is imperative to note that the configuration of these courtyards arose from the need to solve spatial configuration of surrounding building units.

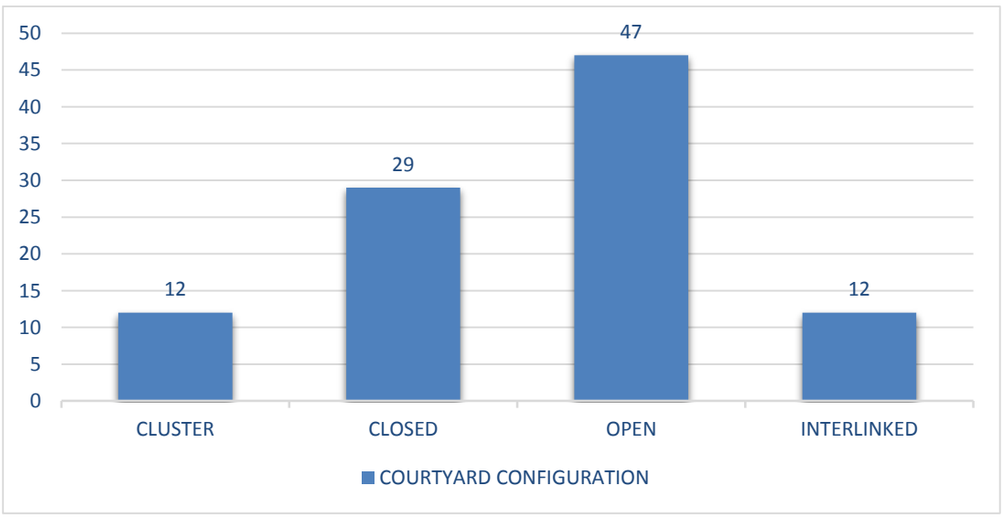

Figure 2: Courtyard configuration Source: Field Work (2017)

Figure 3 shows courtyard forms that are common to the General hospitals observed. The courtyards are in square, rectangle, U-shape and L-shape forms. Figure 3 shows that out of all the courtyards that were studied, 27% were rectangular in shape, 27% were square shaped, 37% were U-shaped and 12% were L-shape. The most common courtyard form is the U-shaped, followed by the squared and rectangular form respectively, then the L-shaped.

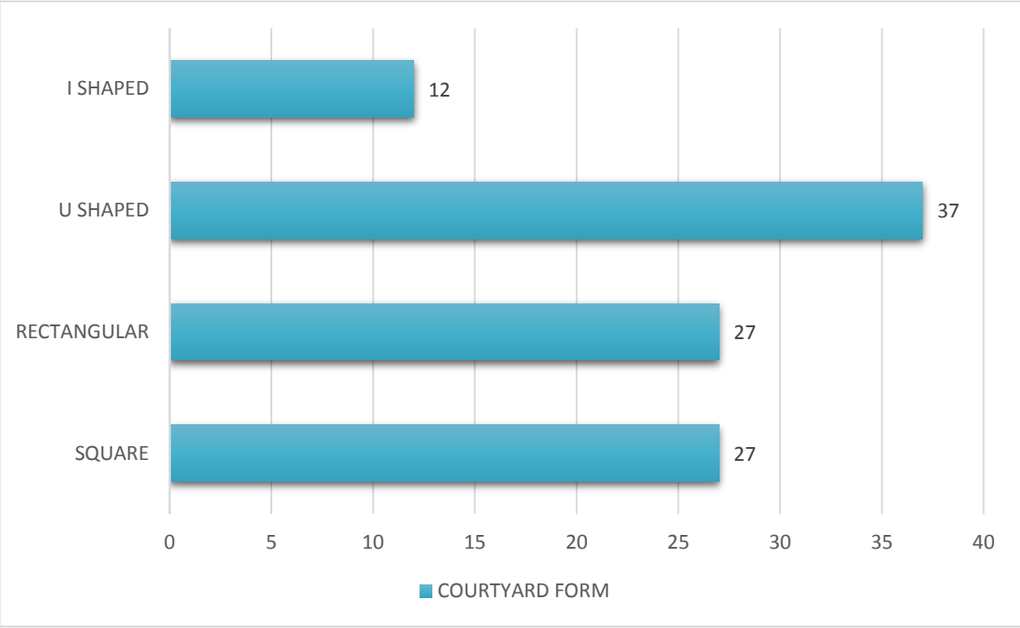

Figure 3: Courtyard form Source: Field Work (2017)

Figure 4 shows the percentages of courtyard orientation in the four cardinal points. Courtyard orientation is the direction to which the courtyard opens towards. In figure 4 the analysis revealed that 23% of the courtyards are in the north orientation, 37% in the south direction, 41% in the west and 14% in the east direction respectively.

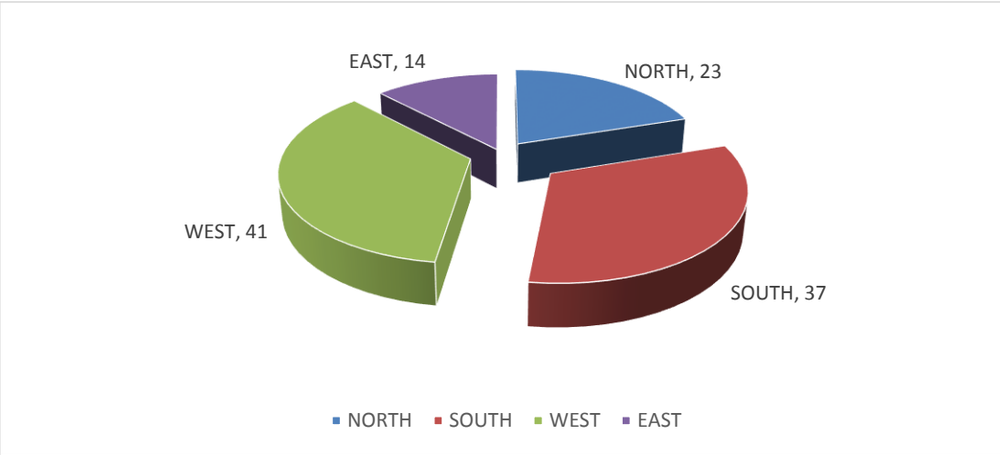

Figure 4: Courtyard orientation Source: Field Work (2017)

Figure 5 shows the heights of courtyards in the hospitals studied. The courtyards heights were grouped between 3500mm high and above 6000mm height. The bar charts in figure 5 revealed that courtyards height of 3500mm high were 31%. Courtyards not higher than 4000m were 37%, while those not higher than 6000mm were 3% and courtyards that were higher than 6000mm were 19% of the total percentage analysed. It implied that most courtyards within hospitals studied were designed not to be 4000mm high. The courtyards will therefore not be able deter solar radiation and air temperature may be high within them and surrounding interior spaces which may cause thermal discomfort.

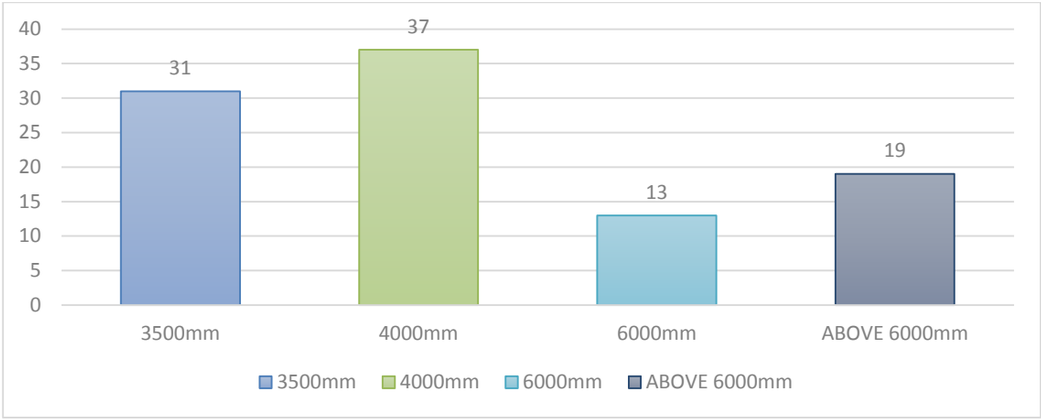

Figure 5: Courtyard height Source: Field Work (2017)

Figure 6 shows the different landscape elements present in hospital courtyards. The bar charts reveal that all courtyards have vegetation which is 60%, 13% of the courtyards had sit outs, no courtyard had water pond and 27% of the courtyards had over hangs. Survey has revealed that presence of water pond within a courtyard can improve courtyard relative humidity level and thus influencing positively the atmospheric conditions of that particular environment.

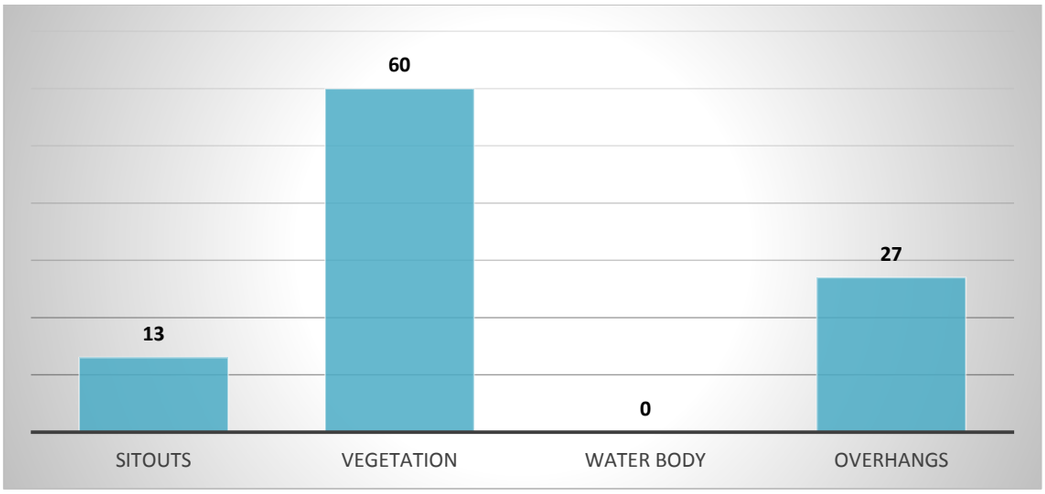

Figure 6: landscape elements in courtyards Source: Field Work (2017)

CONCLUSION

This paper made efforts in assessing the design characteristics of courtyards in hospitals in Niger State as well as the functions they perform. Most courtyards in the hospitals were used to enhance day-lighting and ventilation. The configuration of courtyards in hospitals across Niger State is more of open configuration, while 68% of courtyards heights are not higher than 4metres. The ability of nature to be used in the healing process through the effect of healing gardens were not properly adopted in many of the hospitals in Niger state. Integrating sustainable functions within the courtyard space will help improve the micro climatic and therapeutic potentials in the courtyard.

RECOMMENDATIONS

In other to achieve functional courtyards in hospitals, the proper designing of courtyards in hospital buildings and their environments must be treated with great importance. Architects should have a better understanding of how courtyards can be adopted in the design hospitals. They should know how to design garden layouts in hospital environments; in respect to the type of plants needed in a particular layout and environment. Atriums and courtyards should be design with the right species of landscape to create a calm recovery environment, and relaxation areas should be designed with plants that depict its function in respect to relaxation. Architects should also know the design principles required in creating a functional courtyards in hospitals. Architects and designers should design courtyards to depict various functions in hospitals. These functions includes healing, relaxation, ventilation and lighting By putting into considerations several design variables like wall heights, enclosure components around courtyards, configurations and landscape elements can make courtyards perform optimally in terms of thermal comfort, natural ventilation and lighting and therapeutically and in the end, benefit the patients' overall health.

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DESIGN CONSIDERATIONS FOR PEDESTRIAN CIRCULATION CONTROL IN GENERAL HOSPITALS, ABUJA

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Many hospitals have developed over a number of years in a piecemeal fashion. This has resulted in complex environments made up of long and confusing corridor systems constituting more challenges and frustratingusers of the building. The importance of circulation to building use over the years has not made much impact in the design of general hospitals in Nigeria. However, evidence suggests that improving access and people circulation in hospitals can improve staff performance, enhance patients' rate of recovery, reduce the delay time of external service delivery and create a more welcoming environment for visitors. Consequently, the need to design hospital layouts that benefit from the most effective circulation system cannot be over-emphasized. Thus, there remains a need to find more effective connectivity solutions to the problems that continue to occur in complex hospitals.This research aims at at highlighting the important design consideration for circulation control in general hospitals in Abuja.The study adopts a qualitative design approach, with the aid of observation schedule and interviews that were used to solicit information at the hospitals. The data obtained was content analyzed and represented using table and charts. The research brought together the emergence of design and knowledge management which sensitizes designers to the varied contextual knowledge levels of connectivity in hospital design in Nigeria. Drawing on findings, the research has proffered prescriptive and evaluative connectivity frameworks to aid the design of effective connectivity systems in Nigerian Hospital.

Key words: Accessibility, Circulation, General Hospital, Wayfinding, Pedestrian.

INTRODUCTION

Evidence suggests that people often blame themselves for lacking the acumen to navigate complex environments (Rooke*et al.*, 2009). However, several scholars (Baskaya et al. 2004) shift the blame away from the people, they assert that getting lost is an indication of either a poorly designed environment or connectivity strategies designed to guide people and not inadequacy on the part of the individual.However, the challenges associated with designing for the circulation needs of the different groups of users; the blind, elderly, children, newcomers, foreign visitors, wheelchair users who visit complex environments such as hospitals are immense.

Research has linked the quality of care, patient health and wellbeing with the physical attributes of the healthcare environment (Gesler*et al.*, 2004). It is understandable that supportive built environments with good internal layouts, accessibility, and circulation can create an overall inviting, calming, engaging, and more hygienic and productive healthcare environment for staff, patients and their relatives (Nazarian*et al.*,2011). Design of a healthcare unit influences the patients' quality of care in many ways. One of the known effects of the hospital layout on care quality is the amount of wasted time because of the unnecessary journeys by the staff. Some studies have investigated the impact of the unit layout on the amount of time spent walking (for example Shepley, (2002); Shepley and Davies, (2003); Sturdavant, (1960); and Trites et al, (1970).

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They demonstrated that time saved walking was translated into more time spent on patient-care activities and interaction with family members in several studies.The major problem associated with hospital has to do with connectivity of spaces, the inter-relationship between spaces and the nearness between activity flows (Idoko, 2014). Accordingly, hospitalsare made up of complex system of interrelated functions requiring constant movement of people and goods, thus requiring good circulation. Most times, unresolved pedestrian circulation patterns cause a lot of problem in the hospitals and even lead to accidents such as collision between staff and patients and it also amounted to the staff being worn out before their shift is over (Nazarian*et al.*,2011).

Therefore, this study intends to address the provision of good and efficient pedestrian circulation control in general hospitals, Abuja.

According to Henning Lensch (2010), 'the specialty of the Hospital of Tomorrow will be a combination of features for the well-being of not only the patients and their relatives, but also the doctors, nurses and all the staff of the hospital as well. In line with the aforementioned reasons, it is therefore important to integrate design considerations with a resolved pedestrian circulation pattern and their relationship be developed in general hospitals in Nigeria

Basic Quality Requirement for a General Hospital

The requirements for general hospitals are Reachability, access and flexibility. According to Olanda(2002), general hospital should be easily reachable by public transport, assessed on the basis of transport frequency and the distance to the stop, and also by taxi, car or bicycle.The site needs to be easily accessible by patients, visitors and staff. Additionally, accessible car parking which involves the appropriate designation and location of both car and multi-purpose vehicle parking bays and the provision of set-down/pick-up bays should be incorporated. The entrance to the emergency department and if necessary the main entrance should be accessible by ambulance. According to the building access handbook 2014, public entrances to a hospital building should comply with minimum dimensions and also be accessible by people with a physical handicap. These entrances should be covered over and provided with good lighting. The main structural design of a hospital should possess a high degree of flexibility. The building structure should be simple to extend at different points and should be able to cope with internal displacement(Olanda, 2002).

Understanding Circulation in Hospitals

In architecture, circulation is an architectural planning process. In particular, circulation routes are the pathways people take through and around buildings or urban places. Circulation is often thought of as the 'space between the spaces', having a connective function, but it can be much more than that.(Ching, 2016) It is the communication among differentiated spaces and between the exterior and the interior. It may be achieved by openings alone in the simplest plans, but most buildings require distinct spaces allotted to horizontal and vertical circulation (corridors, lobbies, stairs, ramps, elevators, etc.). These are designed by the procedure of analysis employed for differentiating uses(Idoko, 2014). However, circulation is much more than mere allocation of common space. Its significance lies in the proper integration of the many departments of the hospital so that different -types of traffic traversing the length and breadth of the hospital are separated as much as possible, traffic routes are kept short, and patients and other important functions are protected against intrusion and from the risk of hospital acquired infection.

Pedestrian Circulation:

Every trip begins and ends as a pedestrian trip whether walking to a bus stop or across a parking lot to your car. Any person who is afoot or who is using a wheelchair, or a means of conveyance propelled by human power other than a bicycle" Handicapped Pedestrian as:

"A pedestrian, or person in a wheelchair, who has limited mobility, stamina, agility, reaction time, impaired vision or hearing, or who may have difficulty walking with or without assistive devices"

Understanding the needs and characteristics of pedestrians and factors that affect pedestrian travel is important when designing pedestrian facilities. Pedestrian facilities" are far more extensive than just sidewalks. Sidewalks, trails, curb ramps, traffic calming and control devices, grade separated crossings, wide shoulders and other technology, design features, and strategies intended to encourage pedestrian circulation.

Pedestrian Needs:

In order to successfully design pedestrian facilities, we must recognize that pedestrian needs are wide-ranging, and our design approach must be flexible to meet the diversity of needs.Pedestrian needs are diverse, some of pedestrian needs are safe streets and walking areas, convenience, nearby places to walk, visibility, comfort and shelter, social interaction, attractive and clean environment to mention but a few (Otak I. , 2003).

Pedestrian Facilities:

Pedestrian facilities, which are facilities specifically intended to accommodate people walking, generally include crossings, refuge islands, pedestrian signs and signals, information technology systems (ITS), sidewalks, other walkways, curb ramps, public transit loading zones, grade-separation structures, call boxes, and street furniture(Otak, 1997).

Types of Circulation in Architecture

Horizontal circulation; the design of horizontal circulation system determinates the entire structure and the basic shape of the building. There are four practical requirements of any horizontal circulation system. They are:

1. Any horizontal circulation need to have an adequate proportion and size.
2. Every horizontal circulation need a good circulation plan to determinate the direction.
3. In the horizontal circulation the points of converging traffic must be well express.
4. Changes in levels must be clearly expressed

The importance of the horizontal circulation in architectural planning are very big because this type of circulation permit to the designer create a different access to the building or the cities with the purpose of create a good circulation because if the circulation are very confuse that create a chaos in the building or the cities and create a many problems.

Vertical circulations are those which furnish means for progress from one level to another. The position of any means of vertical circulation is a matter of great importance because such circulations not only control the plans of the various floors they connect but also condition the plan of each floor since they furnish the major approach to it.

The four principal types of vertical circulation are: Ramps, Stairs, Escalator and elevator.

Circulation Elements

The circulation path is the space that links the other spaces of a building or any other interior or exterior spaces(Ammar, 2015). These elements include Approach, Entrance, and configuration of the path, and form of circulation space.

Wayfinding

Wayfinding is a person's spatial behavior or orientation. Spatial orientation is the static relationship to space or the environment. The concept of spatial orientation is the predecessor of wayfinding. This relationship requires the user to form an overall mental image of the layout of the place. This image is referred to as the cognitive map of the setting (Huelet, 2007). Wayfinding, can be translated into a cognitive process of three tasks: cognitive mapping or information gathering, decision making and decision executing or the behavior of navigating space(Malkin, 2002).The legible elements of wayfinding include paths, edges, districts, nodes, and landmarks (Colette Miller and David Lewis, 1999). Paths denote walkways, both horizontal and vertical. The walls and boundaries of a space are edges. Districts can be explained as a region into which one must go inside; they contain identifiable characteristics that allow the space to be recognized as separate(Lynch, 1960).

RESEARCH METHODOLOGY

This study adopts a qualitative research method in which primary data was obtained by observation and detailed study of the selected hospitals and also by interviews with staffs and patients. Secondary data was obtained from text books, journals, and internet sources. A deliberate sampling technique was adopted. The data collected was analyzed by simple descriptive statistics presented in tables and charts. The research was conducted in Abuja Municipal area council using purposeful sampling method.

Table 1.0 Name of Selected hospital

S/n	Name of Hospital
1	Wuse District Hospital
2	Asokoro general Hospital
3	Gwarimpa District Hospital
4	Garki General Hospital
5	Maitama District Hospital
6	National Hospital

DISCUSSIONS OF RESULTS

Vertical Circulation

Table 2.0 shows that 58% of the studied population made use of stairs with width of about 1.5m to 1.8m. This shows that the width of stairs should be wide enough to allow people to negotiate them comfortably by holding the handrails or by being assisted. The width of staircase should reflect the amount of pedestrian traffic. Ramps are provided wherever stairs obstruct the free passage of pedestrians, mainly wheelchair users and people with mobility problems. In table 3.0 and figure 1.0, it can be observed that the width of ramps should be wide enough to so that people can use both handrail if they so wish and 67% of the sample size made use of ramps of about 1:10 slope ratio. The adoption of ramps in hospital designs enhances connectivity between various floor levels. It facilitates the egress of wheelchair users.

Table 2.0 Width of Staircase

S/n	NAMES OF HOSPITALS	1.2m to 0.9m	1.2m to 1.5m	1.5m to 1.8m	Above 1.8m
1	ASOKORO DISTRICT HOSPITAL			✓	
2	GARKI GENERAL HOSPITAL		✓		
3	GWARINPA HOSPITAL				✓
4	MAITAMA HOSPITAL			✓	
5	NATIONAL HOSPITAL				✓
6	WUSE HOSPITAL			✓	
		-	1	3	2

Source**:** Author's fieldwork, 2017

Table 3.0 Width of Ramps

	NAMES OF HOSPITALS	Less than 900mm	900mm to 1200mm	1500mm to 1800mm	Above 1800m
1	ASOKORO DISTRICT HOSPITAL			✓	
2	GARKI GENERAL HOSPITAL				✓
3	GWARINPA HOSPITAL		✓		
4	MAITAMA HOSPITAL			✓	
5	NATIONAL HOSPITAL			✓	
6	WUSE HOSPITAL			✓	
		-	**1**	**4**	**1**

Source**:** Author's fieldwork, 2017

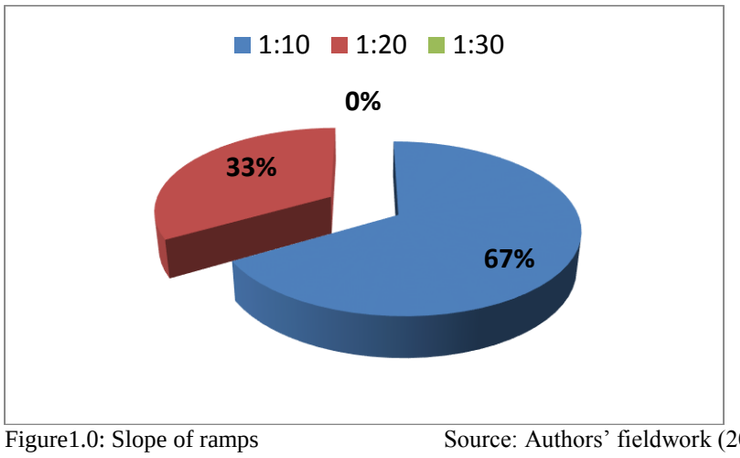

Figure1.0: Slope of ramps Source: Authors' fieldwork (2017)

Horizontal Circulation

The first phase of the circulation system of a building is the path that we use to approach the entrance. As shown in Table 4.0, 83% of the studied population made use of frontal approach. This enhances easy access to various department of the hospital.The location of the entrance, relative to the space entered, will determine the configuration of the path within the space and the pattern of the activities within the space.

Table 4.0Building approach

	NAMES OF HOSPITALS	Frontal approach	Oblique approach	Spiral approach
1	ASOKORO DISTRICT HOSPITAL	✓		
2	GARKI GENERAL OSPITAL	✓		
3	GWARINPA HOSPITAL	✓		
4	MAITAMA HOSPITAL		✓	
5	NATIONAL HOSPITAL	✓		
6	WUSE HOSPITAL	✓		
		5	1	-

Source**:** Author's fieldwork, 2017

Table 5.0Type of building entrance

	NAMES OF HOSPITALS	Flush entrances	Projected entrances	Recessed Entrances
1	ASOKORO DISTRICT HOSPITAL			✓
2	GARKI GENERAL OSPITAL			
3	GWARINPA HOSPITAL		✓	
4	MAITAMA HOSPITAL			✓
5	NATIONAL HOSPITAL		✓	✓
6	WUSE HOSPITAL			✓
		-	**1**	**4**

Source**:** Author's fieldwork, 2017

Rigid handrails support the weight of a person leaning on them to prevent or arrest a fall. As shown in figure 2.0, 38% of handrails where provided in staircases while they were not adequately provided in other circulation elements to control and aid safety of pedestrian movement. Vertically Ramps should support 95% of continuous handrails on stairways, ramps and landings help people to negotiate changes in direction.

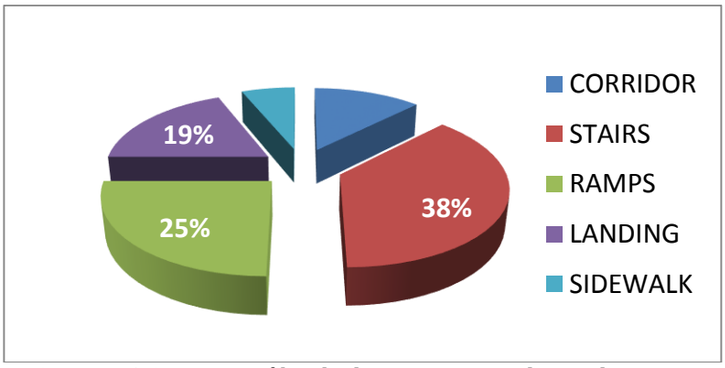

Figure 2.0: Provision of handrails in various circulation elements.
Source: Authors' fieldwork (2017)

Corridors connect spaces and in emergencies, form part of escape routes. The type of traffic expected to pass through a corridor will influence the size of the corridor and the decision to provide double- or single-leaf doors In figure 3.0, 53% of the studied population made use of width of corridors above 2.4m.This width allows for varying users to pass in between the defined passing spaces and for the positioning of a 1m door set for access/egress. The recommended minimum clear corridor width for general traffic, where there is a low volume of traffic and passing spaces are provided, should be between 1.2m to 1.5m. It is preferred that passageways be no less than 1 220 mm wide to allow an ambulant person to pass a person in a wheelchair. A minimum clear width of 1 500 mm is necessary to allow two persons in wheelchairs to pass one another.

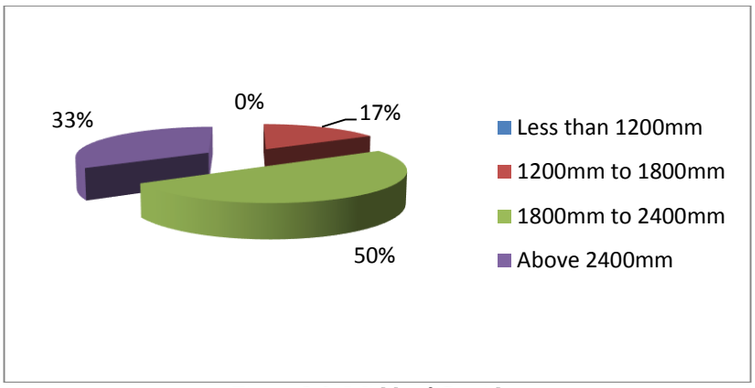

Figure 3.0: Width of Corridor
Source: Authors' fieldwork (2017)

Sidewalks function as integral components of circulation features where pedestrians can experience safety, comfort, accessibility, and efficient mobility. Sidewalks and walkways increase pedestrian safety by separating pedestrians from vehicle traffic. In figure 4.0, 57% of the studied population made use of sidewalks of above 1.8m width. This shows that sidewalks should be wide enough to allow two users to pass each other.

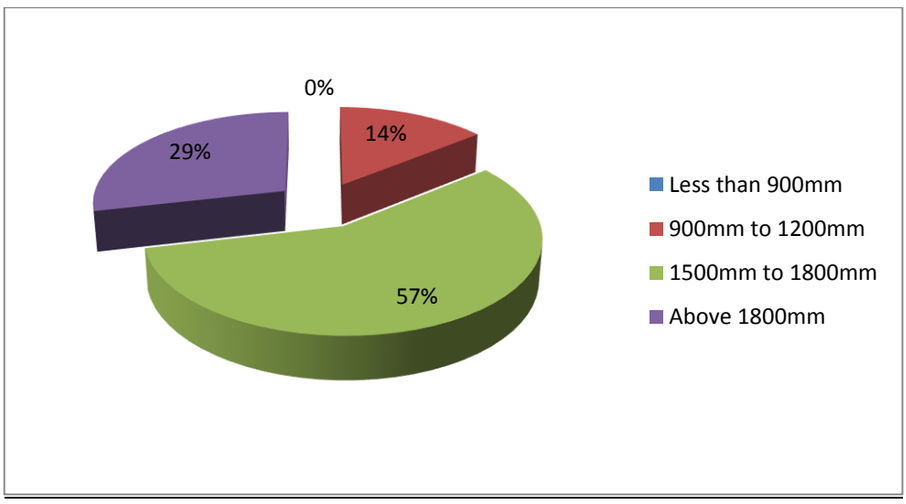

Figure 4.0: Width of Sidewalk
Source: Authors' fieldwork (2017)

Wayfindingis the formation of a cognitive map through interpretation of key elements by a patient. a person's general view of the city is punctuated by specific directional concerns. As shown in figure 5.0, wayfinding features were not adequately incorporated in the studied population. The nature of a path's configuration influences the organizational pattern of the spaces it links.Pedestrians, require a greater volume of space than their bodily dimensions, and greater freedom of choice along the path.Crossing of the paths is always a point of decision-making for the person approaching it. Figure 6.0 show that 39% of the studied population made use of linear path. The movement path is always linear. This shows that linear path is the primary organizing element for a series of spaces. 23% made use of grid configuration of path which consists of two sets of parallel paths that intersect at regular intervals creating square or rectangular spaces due to its simplicity in connectivity.

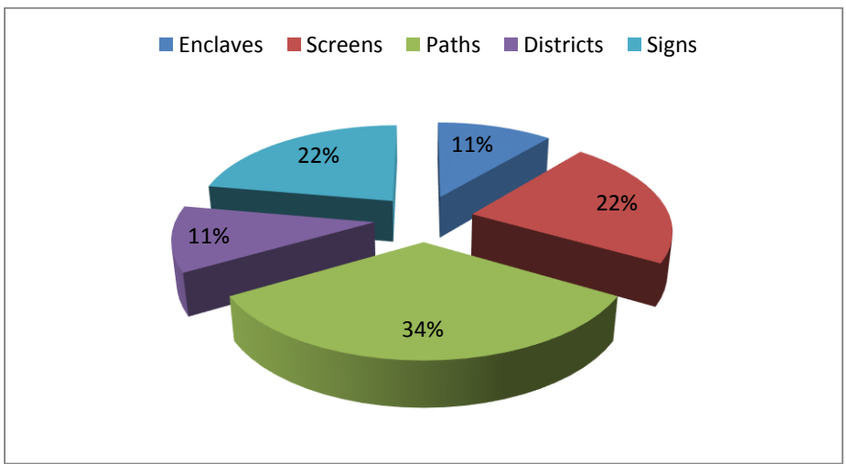

Figure 5.0: Availability of wayfinding features Source: Authors' fieldwork (2017)

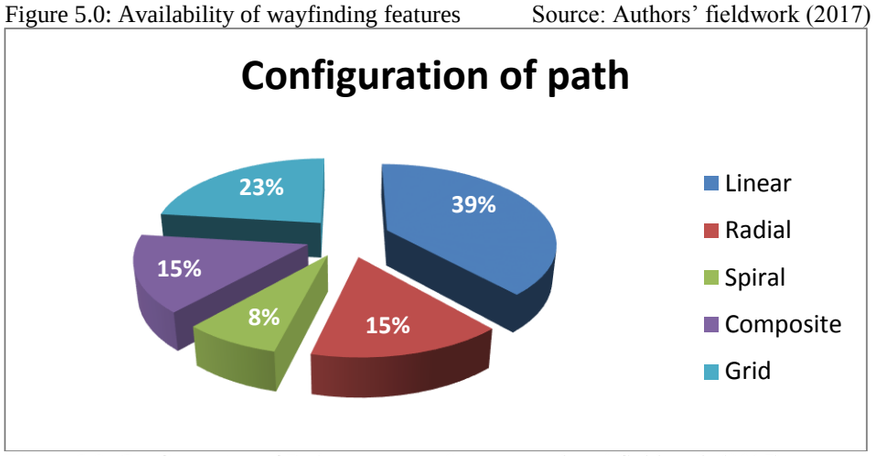

Figure 6.0: Configuration of Path Source: Authors' fieldwork (2017)

CONCLUSION

Circulation routes are very crucial spaces in hospital design. It has been established that it does not only assist staff, patients and visitors in way finding within hospitals, but protects them from risks, provide the shortest routes for them to traverse. In addition it aids movement around; helps control traffic within hospitals and also facilitate the healing process by the use of certain design features and elements. The primary users of a health facility are the patients, the health facility staff and the visitors should be considered before any decision is made. Heavy traffic is bound in some departments like the out patients department while in others is less, as it is restricted to some category of people like the delivery suite.

Generally, circulation routes should be direct and kept as short as possible and should have separate entrances for the different departments, people, supplies and short, direct and un-conflicting circulation routesin this facility cannot be over emphasized. In a study involving hundreds of hospital plans, experts observed a large number of bad schematics. In almost every oneof them, they could trace the trouble to failure to heed the basic principles of circulation.

Finally, it should be noted that the whole planning guideline of a hospital centers mainly on patients' care and inter-departmental relationship; therefore caution should be taken in the integration of thesedepartment in order to create an architecture that would not only facilitate the recovery of patient and enhance staff efficiency, but also enhance the cityscape and make provision for effective circulation. It is also necessary to provide a separate entrance for doctors to minimize unnecessary enquiries from patients and their relations.

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ADAPTIVE REUSE DESIGN CONSIDERATION IN CAMPAIGN OFFICE BUILDINGS IN MINNA, NIGER STATE

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Political office is a public building purposely built for the daily activities of a registered political party. The structure is usually deserted after the conduct of the general elections. This study therefore examines the necessary design considerations for putting the structure to use for other similar purposes even beyond the conduct of the election without remodeling the structure. Purpose sampling technique was employed to select two out of five different political offices in Minna. Questionnaires and observation schedules were used to gather information from some selected campaign offices in Minna, Niger State. A total of 200 questionnaires were administered across the selected buildings and 151 questionnaire were retrieved (75.5%). The results were analysed using descriptive analysis and the 4-likert scale measurement. The results show that there is significant satisfaction for open space office model for adaptive reuse in office design.

Keywords: Adaptive, campaign, office, public buildings, reuse

INTRODUCTION

Political party offices are a part of the electoral requirements in Nigeria (Independent National Electoral Commission, 2014). Nigeria, country that runs a multi-party system with a total of thirty- three registered political parties (INEC, 2014).These political parties are in need of offices where candidates, supporters and volunteers can meet to carry out different activities during and after elections activities. According to INEC, (2014).A requirement for the registration of a political party is that the National Headquarter of the party must be located in Abuja and the party must have offices in at least 24 states of the Federation (Guidelines for the Registration of New Political Parties, 2014). This leaves Minna city scape with an astounding number of political campaign office buildings. However, these offices are mostly left under-used or vacant during the periods following electoral activities. Adaptive reuse refers to the process of transforming buildings for different or alternative functions while retaining their original features. It describes the way by which an old site or building can be used for another use other than the one it was originally built or designed for whereby the character of the building is preserved and the purpose is transformed (U.S. National Park Service,2015). It is a practical way of lowering environmental impact (Mitchell, 2002). In this way, it is a sustainable alternative as it ensures that vacant and old buildings can be put to various options of use.

Adaptive reuse provides a means of building conservation by finding a new use for it. According to Olagoke, (2014), the process of converting a building for adaptive reuse can also be termed as renovation, retrofitting, reworking, remodeling or refurbishment. Changes made to the original structure may range from obvious changes to minor alterations and additions to the old configuration or destruction of a part of it.

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Jimoh & Abdulrahman (2018). **ADAPTIVE REUSE DESIGN CONSIDERATION IN CAMPAIGN OFFICE BUILDINGS IN MINNA, NIGER STATE.** Contemporary Issues and Sustainable Practices in the Built Environment. School of Environmental Technology Conference, SETIC, 2018

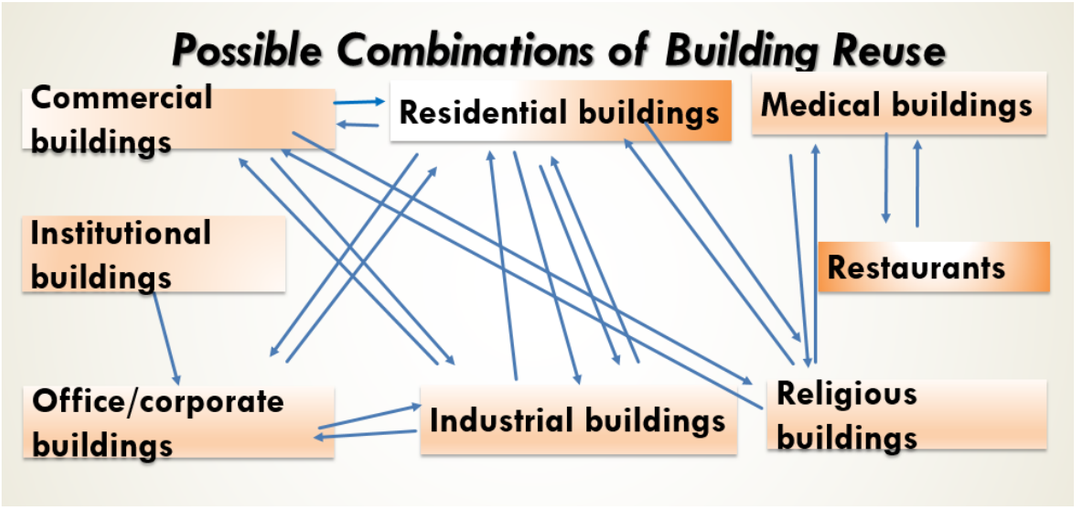

Figure 1.0: Show Possible Combinations of Building Reuse Concepts
Source: Ojikpong et al (2016).

The aim of this research is to evolve flexible design considerations that will enable the party offices to be reused for other private or public uses without undermining its primary purpose as a political party office building. The aim of this research will be achieved through the following:

Determination of user satisfaction in office buildings based on the use of space.

Identifying and investigating the physical parameters of what allows the conversion of campaign office building to other uses.

Types of Office Layout

Open Plan Office

The open office structure is described as a flexible space with freedom from oppressive walls and enclosures (https//www.archdaily.com/tag/open-plan. Retrieved on 24th November, 2017). Open plan office employs the use of large open spaces with workspaces.

Closed Plan Office

A closed office is also referred to as an enclosed office or private office space. It employs the use of cubicles, sections and partition materials to provide distinct spaces for individual workers (www.santaclaraofficesolutionsca.com. Retrieved on 24th November, 2017)

Uses of Office Accommodation

Adaptability in design is defined as making a thing suitable to situations and adjustment to fit. House (2010). In building conversion, it is disposed to open plan, accessibility and its performance as it concerns functionality for its different users. Flexibility is the most available tool that permits a new use in an existing building designed for another purpose (Santos, 2014).

Flexibility

Adedayo et al (2014) opined that establishments employ the open plan office layout to provide flexibility as well as to reduce the cost of space use. Space flexibility enables the ease of the function of a space to be converted to another. The ease in the flexibility of spaces is aided by the modular coordination of different units.

Modular Coordination

Modularity is the extent to which a component can be separated or rejoined. It involves building components such as partition materials and floors which are prefabricated in modules and joined either end to end, side by side or stacked together. The relationship between modular coordination and adaptive reuse is its allowance for flexibility and conversion. According to Saagwe (2010), Modularity as well as 'open-endedness' as it concerns the structural components of a building enables the building to be open for conversion. Modular Coordination applies to building elements as well as furniture in the office space

Internal Partition

Open plan arrangement refers to a universal layout of floor plan or open office which permits spaces to be subdivided based on the spatial requirements of each task. Gells (2000).The existent practice of office establishment that makes use of solid block as internal partitioning constrains the flexibility prospects for the spaces in a building. Adedayo et al (2014). For closed plans, internal partitions such a glass, wood and other collapsible materials enables ease of building conversion for reuse.

Headroom of Spaces.

The volume of a space is dependent on the length, span and height (headroom) of the space. Probable options of adapting for reuse, is dependent on the headroom of a space for easy exchange of air from the lower and upper portion of a given space. The office structure of a political office requires gathering of crowds especially during the conduct of elections and when meetings are held. For ease of conversion, it suffices that the other options of use the campaign office building will be adapted for will put into consideration the headroom of spaces.

Parking Spaces &Adjoining Facilities to Site

The availability of designated parking spaces and the proximity and type of other facilities are external factors to be considered in building reuse. These external factors contribute to the type of use the campaign office can be put to.

Categories of Staff in a Political Party Office

The staff structure of a political party informs the functions and number of offices required in the party office. The staff of a political party can be categorized based on their functions as administrative and non-administrative staff and also on the frequency of use of their offices. The basic official requirements of party offices are;

Table 1.0: Table showing the categories of staff in a political party

ADMINISTRATIVE STAFF	NON- ADMINISTRATIVE STAFF
Chairman	General Staff
Secretary	Volunteers/ Activists/Supporters
Public Relations Officer	Team of ICT Technicians
Welfare Secretary	Cleaners
Financial Secretary	
Treasurer	
State Auditor	
Youth Leader	
Campaign Manager	

Source: Author's Field Work

Spaces in a Campaign Office Building

Offices (for Administrative and Non-Administrative Staff)

Meeting Spaces

Storage Spaces

Conveniences

The Study Area

Minna, the study area of this research is located between longitude 9.5836 degrees North and latitude 6.5463 degrees East. The State is home to many ethnic tribes with the Nupe, Gbagyi and Hausa being the majority. Islam and Christianity are the most practiced religion in Minna, Niger State. It has two local government areas which are Chanchaga and Bosso Local Government Areas. According to the 2006 Population Census, Minna has a population of 201,429 people. By the projections of the National Population Census, the population of Minna is over 300,000. The study area was selected due to the number of political parties present in the urban center.

METHOD OF DATA ANALYSIS

Data for this study was gathered through the administering questionnaires and observation schedules. The prepared questionnaires were administered to selected campaign office buildings in Minna metropolis.

The observation schedule was used to get data concerning the physical conditions of the interior, exterior and the surrounding environment of the campaign office buildings. A total of 200 structured questionnaires were distributed to the users of campaign office buildings to investigate the frequency of use of their office spaces and their perception towards some parameters affecting adaptive reuse of their offices. The respondents of the questionnaires were administrative and non-administrative staff of the party offices. Out of the 200 distributed questionnaires, 151 of those questionnaires were recovered. This gives a percentage of 75.5 return rate. Data acquired was sorted based on individual political party office building and entered into a descriptive statistical tool, SPSS for analysis. A 4-point likert scale was used to analyse the perception of the staff. The output of the data obtained is represented in tables and charts.

DATA ANALYSIS AND DISCUSSION

The factors considered while carrying out this study includes the type of building, the form of building, the layout (close or open office), the internal partition materials, headroom of spaces within the campaign offices.

Office Layout

Usually, the layout of offices has a major role to play in the ease of movement of one office function to the other. It is generally assumed that an open plan office eases work flow from one task to the other. In terms of flexibility, the open office layout is perceived to be more flexible than the closed plan office layout which is characterized by individual spaces accessible by corridors and lobbies. Fig 2.0 showed that 70% of the campaign office buildings employed the close plan office layout while 30% employed the mixed (combination of open and close office plan).

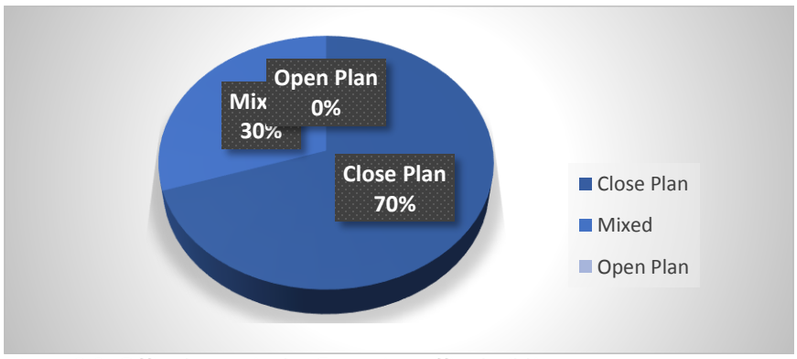

Figure 2.0: Office layout in the Campaign office buildings
Source: Author's Field Work, 2017.

Headroom of Spaces

Fig 3.0 shows that 60% of the campaign office buildings had headroom of 2.7m-3.0m, 30% had a headroom of3.5m-3.7m while 10% of them had a headroom of 4.0m above.

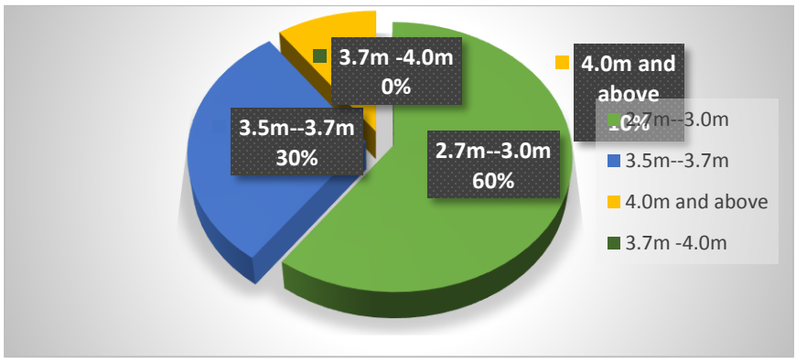

Figure 3.0: Pie Chart showing the headroom of spaces in the campaign office buildings.
Source: Author's field Work

Internal Partition Materials

Figure 4.0 shows the representation of the types of partitioning materials used in the Campaign Offices. 83% of the Campaign offices used solid block wall for partitioning of spaces. 17% of the campaign offices visited employed the use of glass for partitioning. The use of solid block wall for partition restricts the adapting of spaces for reuse. Materials such

as glass, wood, steel, poly vinyl chloride sheets and other composite materials are flexible option of materials that ease conversion.

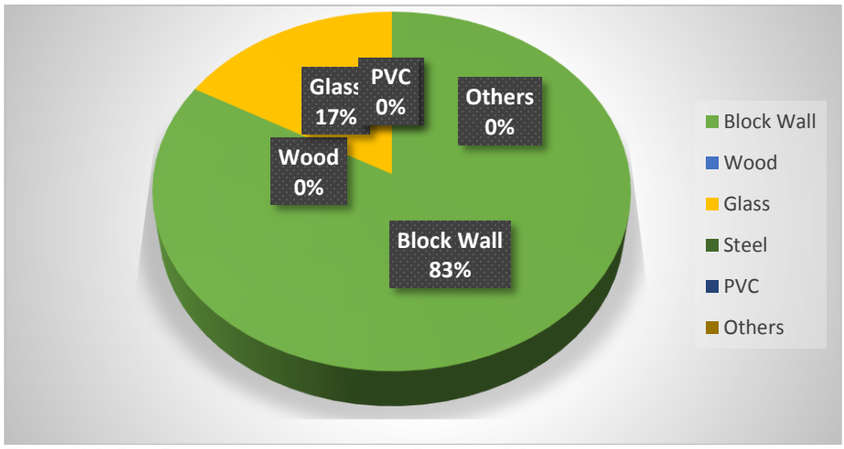

Figure 4.0: Pie Chart showing the type of Partition Materials used
Source: Author's fieldwork (2017)

Parking Spaces

The availability of designated parking spaces and the number of such parking spaces has an impact on the possible use a building is converted to. In the course of the research, the author discovered that 20% of the campaign office buildings had designated parking spaces while 80% of the campaign offices had no designated parking space.

Additionally, the break-down of the percentages of the number of parking spaces are; 50% of the office buildings had no parking spaces, 30% had parking spaces for 0-10 cars. 10% had parking spaces for 0-20cars and the remaining 20% had spaces for 0-30 cars.

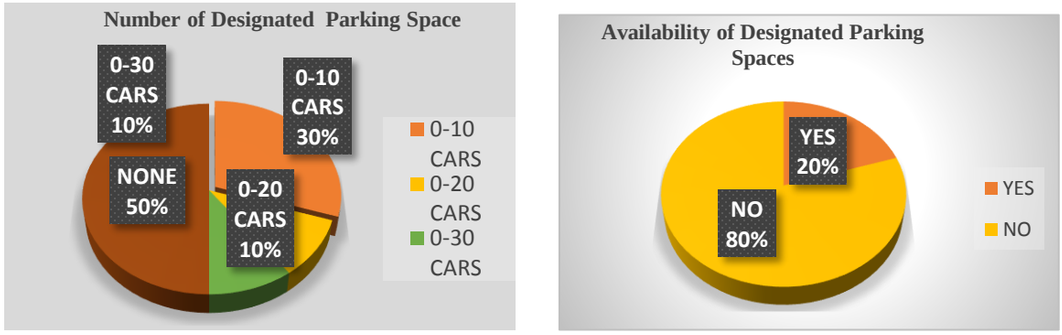

Figure 5.0: Availability of Designated Parking Space, Availability of Designated Parking Spaces
Source: Author's field work (2017)

Building Use and Conversion

Figure 6.0 shows the initial purpose of the campaign office buildings. 46% of the campaign office buildings were formerly used as residential buildings, 27% of the campaign office purposely built as political buildings and retains its use. 27% were formerly built for commercial use.

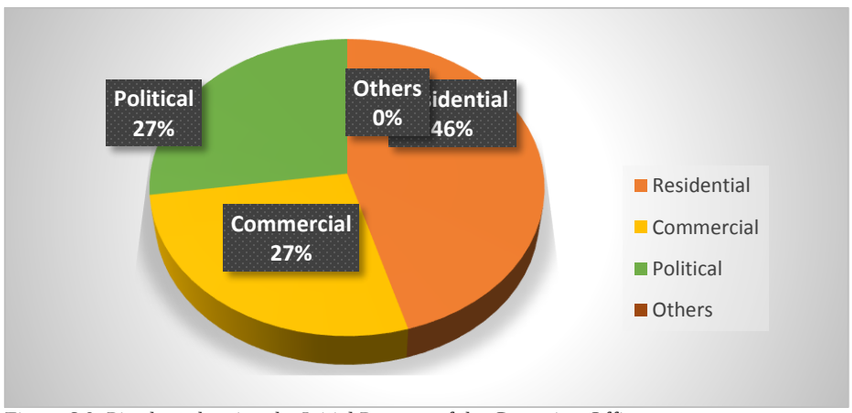

Figure 6.0: Pie chart showing the Initial Purpose of the Campaign Office
Source: Author's fieldwork (2017).

Building Reuse

Table 7.0 below shows the type of use the campaign offices are adapted for when the buildings are not in use as a campaign office. Data shows that 90% of the campaign offices were not reused for other purposes living it vacant following the periods after election, 10% 0f the campaign office buildings were put other alternative uses.

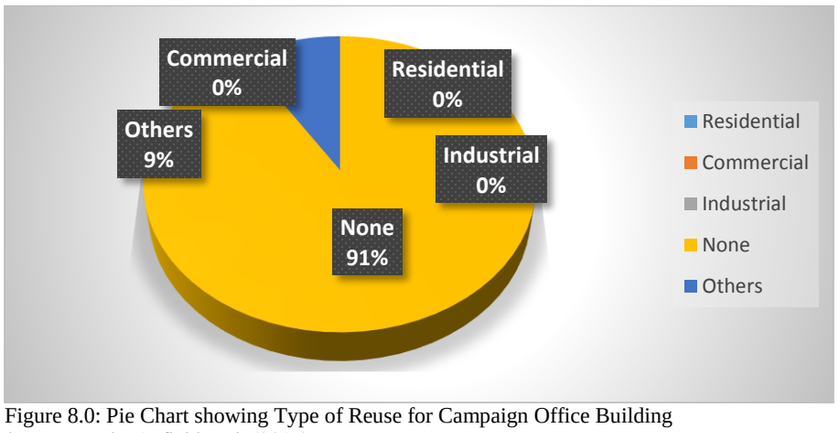

Figure 8.0: Pie Chart showing Type of Reuse for Campaign Office Building
Source: Author's fieldwork (2017)

Frequency of Use of Spaces for Different Categories of Staff

Figure 8.0 shows the frequency of the use of office space in the campaign offices by administrative staff and non-administrative staff. 60% of the administrative staff use the campaign offices as required. 17% of the administrative staff use the office weekly, 17% of the administrative staff also use the office weekly and only 9% of the administrative staff the office daily.

Additionally, 38% of the non-administrative staff use the office weekly, 28% of the non-administrative staff use the office daily, 22% use the office weekly while 12% of the admin staff use the office as required.

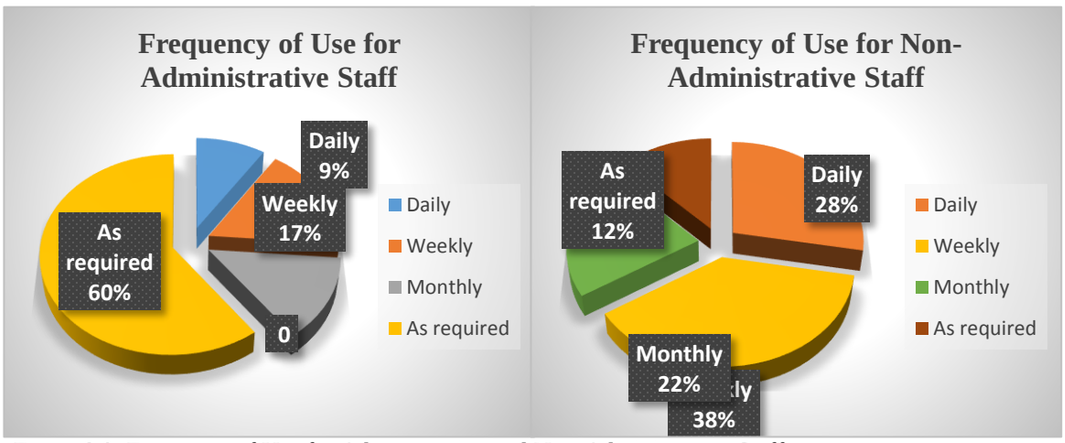

Figure 8.0: Frequency of Use for Administrative and Non-Administrative Staff.
Source: Author's fieldwork (2017)

Respondent's level of satisfaction with the following measured parameters

The 4- Likert scale measurement was uses to analyze the users' perception of their office spaces. The decisions of the respondents were recorded from 1-4.

As stated below:

Very Dissatisfied	1
Dissatisfied	2
Satisfied	3
Very Satisfied	4

Table 2.0: shows the sum of respondent's response to the level of satisfaction with the following measured parameters.

Variables	Very Dissatisfied X1	Dissatisfied X2	Satisfied X3	Very satisfied X4	Total
Size of office	26	62	44	19	151
Natural Ventilation	33	56	33	29	151
Natural Lighting	31	41	52	27	151
number of conveniences	21	33	61	36	151
Parking Space	28	77	30	16	151

Source: Author's fieldwork (2017)

The results are interpreted based on Likert Scale as follows

1.0 - 1.49 Very Dissatisfied

1.5 - 2.49 Dissatisfied

2.5 - 3.49 Satisfied

Above 3.5 Very Satisfied

Table 3.0: shows the sum of respondent's response on the level of satisfaction with the measured parameters

Variables	VD X1	D X2	S X3	VS X4	SUM	MEAN	INTERPRETATION
Size of office	26	124	132	76	358	2.37	Dissatisfied
Natural Ventilation	33	112	99	116	360	2.38	Dissatisfied
Natural Lighting	31	82	154	108	375	2.48	Dissatisfied
number of conveniences	21	66	183	144	414	2.74	Dissatisfied
Parking Space	28	154	90	64	336		Dissatisfied

Source: Author's fieldwork (2017)

CONCLUSION

The effect of the blemish redundant and uninhabited buildings cause to urban centers cannot be under emphasized. This paper attempted to evolve other options of use for abandoned campaign office buildings.

Findings show that the campaign office buildings are left abandoned after the conduct of elections except for a percentage of the administrative and non-administrative staff who use the office when necessary creating the need for permanent offices for them in the campaign office building. The non-administrative staff are mostly present only during the conduct of elections due to electoral activities. This necessitates the need for an open office plan office which can be used during the period of elections and also adapted for reuse for other functions to make it useful for other users. This implies that the other options of use of the campaign office building should not undermine its primary option of use of the party office. This research has also established that the exterior factors such as parking spaces, adjoining facilities to campaign office buildings has a role to play in the form of conversion the campaign offices will be put to so as to enable both the old and new use to adapt fittingly regardless of use.

RECOMMENDATIONS

Architects should employ the principles of adaptive reuse in the design of buildings so as to preserve the buildings and render it economically viable throughout its life cycle. Adaptive reuse concept is a better option to demolition of abandoned campaign buildings as it gives continuous use for campaign office buildings throughout their life cycle and as well as in cases of extension of time.

Open Plan office layout or a close plan with modular partition materials should be employed by architects and interior designers in the design of office spaces as it eases the conversion of the use of a space to another. Multi-functional spaces should also be used in the interiors

of campaign office buildings. Larger headroom should be provided for in office interiors as these increases its ability to be used for other functions.

A building that does not support change and reuse for alternative purposes is considered to have only an illusion of sustainability (Croxton, 2003.) Therefore, architects should embrace flexibility in the design of building structures to enable ease of conversion to other uses.

Abandoned campaign office buildings should be studied and adaptive reuse principles applied to create options of use to enable their extensive use throughout their lifecycle as well preserving its unique cultural heritage.

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EVALUATION OF INTEGRATION OF USERS NEEDS IN PAEDIATRIC WARD DESIGNS IN GENERAL HOSPITALS IN NIGER STATE

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Design of paediatric ward in General Hospitals has mainly been base on the use of secondary data (lent book data) which serve as planning or design guide of whom the actual users of ward is not made use of. There have been re-occurring trends in thinking about the user's needs in planning and designing of paediatrics ward in General Hospitals in Niger state. It is highly accepted of any paediatric ward in General Hospital buildings to suit the needs of all categorize of users and not the users adapting to the building which seem to be trend. Paediatric ward in General Hospitals is a hub of treatment and care synonymous with unpredictable changes arising from demographic displacements or improvements in technology. The aim of the research is to examine the level of integration of users space needs in paediatric ward in General hospitals in Niger State. The research adopted mixed method both quantitative and qualitative method, the use of structured questionnaire and observation schedule. The data obtained was analyzed using description statistics from SPSS and result were computed on Micro-soft Excel. The major problem of users needs in paediatric ward designs in General Hospitals in Niger State is the space needs which most times limit and affect the activities of the users in finding it difficult to perform their duties conveniently, due to the level of Satisfaction. This research will reveal the level of integration of user's needs in paediatric ward design in General Hospitals in Niger State.

Keywords: Buildings, General Hospitals, Integration, Users-need, Paediatric-ward

INTRODUCTION

Hospital is an institution that provides health care and treatment for patient with specialised staff and equipment. The presence of hospital buildings in environments contribute to the healing process and go a long way in complementing the medical attention given to patients. This would also help to enhance staff productivity and job satisfaction amongst health workers. The separation of sick people from their daily life activities is a foundation lay by the hospital. In the time past hospital are often cited at the entrance to towns or perhaps in areas unsuitable for settlement, mostly on the sidelines of a town's business and social centres, (Granshaw and Porter, 1989). This approach however changed over the time, specifically in the sixteenth century when there was a development in the Italian States and hospitals were accorded were given more prominence and elegance of which Martin Luther referred to as "Regal Buildings". Afterwards Hospitals gradually became centres for medical training, clinical laboratories for research and institutions concerned for the welfare of the entire population. Study from Flavia (2012), stated that, hospital buildings will have to consider every users and their needs both physical and psychological aspect. The spaces in hospitals help to promote the values of the buildings and integrating the socio-cultural needs. Space is the cultural and emotional heart of hospital building, and which is the elements that brought design from a technical clinical service to healing place for all users, (Cornwall, 2002). From Richard (2012), state that, the space needs in hospital buildings is equivalent to the operational and business planning assumptions, which result to the need of space, based on likely activities volumes and basic elements.

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Adedokun et al., (2018). **EVALUATION OF SOCIAL INTERACTIVE SPACES OF SHOPPING CENTRES IN ABUJA, NIGERIA.** Contemporary Issues and Sustainable Practices in the Built Environment. School of Environmental Technology Conference, SETIC, 2018

Every space in the hospitals is analysis depend on the activities in each area of operation, time per activities, sizes of ward, rooms, waiting areas, lobby, relaxation place, and other supporting needs. According to Yusuf (2013), one of the basic human need in life, is the healthcare services and mostly in general hospitals. Increasing of different users in general hospital buildings result to increase in ward space and equipment space in everyday activities.

The demand on healthcare service by patients and patient relatives in government hospitals led to increase in medical staff and non-medical staff in hospital buildings, which result to overcrowd within and around the wards. Health to man is more important to him than anything else is, (Ahmed, 2011) absence of different disease in human body does not only signify fine health, but the overall condition of individual, which involves physiological, emotional, and social wellbeing. According to Cordes (1999), state that, when there is a state of good condition, the human functions normally and is therefore, productive, and mentally alert. This explains why health care centres are paramount in providing a potential avenue for the ill and sick person to regain back their health

Issues of Space in Paediatric Ward

The assessment of users' perception with other users in paediatric ward considered that the users' satisfaction in the health care centre is because of care at a time. According to Yusuf (2013) the most important elements in organisations which made it to run smoothly with the activities in it is the space management. For hospitals management, space needs for users is important due to the increase in patient needs. According to Heng and Mc George (2005), reveal that every year they are increase in patients and other lesser in government hospitals. These occur because due to medical and health care service sectors is important in a country. Technology development and demography are new-fangled medical methods for treatment, political changes and social needs influenced in health care industries. The users need for every space and equipment in the wards and facilities in hospitals rise year by year. Statement from Jeyakumar (2004) point that, it is particularly relevant to government hospitals, the need for integration users in space needs in general hospitals in Nigeria is important because, in Nigerian mostly use government hospitals more than the private hospitals. Government hospitals, which is general hospitals bill charge, is lower compare to other hospital and every departmen**t**/unit/ward professionals are ready available.

The problem here revealed by different observer in paediatric ward in hospitals in Nigeria and around the world about, overcrowded of ward, office and circulation areas like the corridor, walk way, parking lots sanitary of the surrounding and most importantly the space need by different categories of users. Hospitals space flexibility is also problem to users in paediatric ward, these factors occur due to the shortage of ward space for all the users and the equipment in paediatric ward. The major problems that face paediatric ward are in Perak.

Relevance Important of Space to Usersi Paediatric Ward

Space to Users in paediatric ward

Space is a major important of users' needs in paediatric ward, which is vital, which need to consider the both physical and psychological needs of the people, which are: sick people in particular, (William, 1992). The most important users paediatric ward range from the professional to the other users, which are the patients, patient relatives, visitor and the caregivers to the patient and patient relatives.

Users Activity and Space Needs

Space needs are usually identified through creation of user's involvement program, which give details to describe the space needs by individual, which include the workload and staffing with spatial requirement of the hospital buildings, (Ministry of Health and Long-Term Care Copies (MHLTCC), 2014). MHLTCC classified the activities of spaces into two categories: clinical space and facility support space.

Clinical Space: is the require space room for the primary health care centre by the staff to perform their core activities, functions and the clinical support rooms, which are the circulation space within and round the hospitals, general waiting and lobby area, exam rooms, counselling rooms, treatment rooms, laboratory, medical staff offices, specialized care and medical/clinical utility rooms.

Facility Support Space: the space is non- clinical rooms and administrative functions or community activities but support these group:

Administrative Support Space: this space support all activities of medical staff and non-medical staff to perform their functions, area like the reception, users waiting areas, work areas and support staff facilities.
Shared Spaces: support both the users of the hospital buildings irrespective of their activities, the interview areas, counselling rooms, meeting rooms, and kitchen areas.
Cultural Spaces: they are space were directly core health care related with cultural activities is perform for particular patients and patient relative, like traditional healing, meditative or ceremonial space for patient who put to bed under cross section (CS) and need time to recovery within period of 21 days.
Building facility Support spaces: this are area were electrical and mechanical functions is carry out and space for garbage, storage, (Ministry of Health and Long-Term Care Copies (MHLTCC), 2014).

Importance of User's Integration (Involvement) in Hospital Buildings

Integration of user's at the beginning of any design brief, is normally seen as a critical activity, to identify the different needs requirement by different users of the building, and the wishes of the future users of that building, (Jensen et al., 2009). From Jensen and Pedersen (2009), further gave example to explain the needs for integrating inclusive design brief, which serve as interactive way, where the demand and supply are involved in both requirements of their needs during the process of the design. The analysing and addressing the users need for feedback in any complex building, or organisation or institutions to aid dialogue, with all stakeholders of such building (Prins et al., 2011), and Jensen et al., (2011), came up with a guided learning and dialogue process from users involvement in hospitals in Demark.

RESEARCH METHOD

The research adopted mixed method, the use of structured questionnaire and observation schedule. The study covered selected paediatric ward in General Hospitals in Niger State. A sample size of 5 staff was selected in each studied building leading to a total of 120 respondents as shown in table 1.0. Observation and interview was conducted in the building and respondents were randomly selected. The data was analysed using descriptive statistics in SPSS version 21. Cross tabulation was used to determine the relationships between selected variables. The results are presented in charts and tables while plates are used to describe existing situations.

The population for this study are the users of General Hospitals in Niger State, from all senatorial constituencies (district) in Niger State. The senatorial constituency in Niger State is zones into three (3). This covers the human respondents in the study. The General Hospitals in all senatorial constituencies (district) in Niger State, form the population for the study in regards to the buildings, also includes the facilities provided in the hospital. Nine General Hospitals selected in each senatorial constituency, and were based on

i. The population of habitants and density in the areas, and
ii. The size of bed capacity on each hospitals, form the sample frame for the research.

The fuel hospitals selected from each Senatorial district are:

a) Senatorial Constituency – Niger East (SD/076/NG)

Table 5.0; list of selected Senatorial Constituencies (District) Areas in Niger State, Nigeria

Local Government area	Number
Chanchaga	201,429
Shiroro	235,404
Suleja	216,578

b) Senatorial Constituency – Niger North (SD/077/NG)

Table 6.0; list of selected Senatorial Constituencies (District) Areas in Niger State, Nigeria

Local Government area	Number
Kontagora	151,944
Magama	181,653
Mashegu	215,022

c) Senatorial Constituency – Niger South (SD/078/NG)

Table 7.0; list of selected Senatorial Constituencies (District) Areas in Niger State, Nigeria

Local Government area	Number
Bida	188,181
Lapai	110,127
Mokwa	244,927

Sample Size

As noted in 5.0, 6.0 and 7.0, the total users are the service providers (medical staff and non medical staff), Facilities management and services personnel building, management of the organization based in the hospital, service receivers (patients), indirect service receivers (patient relatives) and owners. During the time frame in each ward, four (4) doctors, six (6) nurses (2 matrons and 4 nurses), 12 patients, 12 patient relatives, 4 non-medical staff and 4 visitors were the sample size for the research. The sample size was based on the average capacity of the General Hospitals ward. The method of data collection is an extensive questionnaire, observation schedule, which combined the level of satisfaction of the users in paediatric ward spaces. Total of 126 questionnaires were be administer to users of the 9 ward in each General Hospital.

RESULTS AND DISCUSSION

Likert Scale Measurement of Users Space Needs in Paediatric Ward Designs In General Hospitals in Niger State

In determining the level of satisfaction in paediatric ward in selected General Hospitals by the users likert scale of 4 was used which ranged from "Very Dissatisfied" to "Very Satisfied" as shown:

Very Dissatisfied	1
Dissatisfied	2
Satisfied	3
Very Satisfied	4

Table 8.0: Number of respondents per opinion on Satisfaction on Users Space needs in Paediatric Ward In General Hospitals

Measured Variable	Very Satisfied	Satisfied	Dissatisfied	Very Dissatisfied	Total
Rating of Nursing Station Spaces	29	369	630	105	1133
Rating of Patient Spaces	21	353	634	130	1138
Rating of Patient Relative Space	8	189	651	290	1138
Rating of Visitor's Space	6	201	604	342	1135
Rating of Circulation Spaces	19	454	532	130	1135
Rating of Furniture Spaces	25	409	584	118	1136
Rating of Storage Spaces	30	356	597	150	1133
Rating of Lobbies Space	30	454	488	160	1132
Rating of Consulting Room Spaces	20	253	666	198	1137
Rating of Toilets Spaces in Ward and Clinic	10	144	501	482	1137
Rating of Bathroom Spaces in ward and Clinic	9	155	491	482	1137
Rating of Waiting Area Spaces	14	343	639	142	1138
Rating of Reception Spaces	33	408	523	173	1137
Rating Common Room Spaces	11	250	494	368	1123
Rating of General Toilet Spaces	2	78	379	676	1135
Rating of Arrangement of Fittings Spaces	24	505	480	124	1133
Rating of Spaces in Praying Area	88	586	274	79	1027
Rating of washing Spaces	7	221	464	446	1138
Rating of Drying of Cloth Spaces	6	128	416	581	1131
Rating of Cooking Area Spaces	2	65	339	560	966
Rating of Spaces in Courtyard	33	577	379	140	1129

In Table 8.0 the spread of the respondents regarding issues related to the variables related to the users space needs in Paediatric Ward designs were quite divergent as was observed by

the figures provided. It will be observed that the level of satisfaction will be determined by the use of mean of the values allotted to the options selected by the respondents on the Likert Scale measurements. This scale will be further explained in Table 10.0, showing the results base on the level satisfaction of the users.

Table 9.0: Weighted Score of Users respond on Level Satisfaction in Paediatric Ward

Measured Variable	Very Satisfied x1	Satisfied x2	Dissatisfied x3	Very Dissatisfied x4	Total
Rating of Nursing Station Spaces	29	739	1890	420	3078
Rating of Patient Spaces	21	706	1902	520	3149
Rating of Patient Relative Space	8	378	1953	1160	3499
Rating of Visitor's Space	6	402	1812	1368	3588
Rating of Circulation Spaces	19	908	1596	520	3043
Rating of Furniture Spaces	25	818	1752	472	3067
Rating of Storage Spaces	30	712	1791	600	3133
Rating of Lobbies Space	30	908	1464	640	3042
Rating of Consulting Room Spaces	20	506	1998	792	3316
Rating of Toilets Spaces in Ward and Clinic	10	288	1503	1928	3729
Rating of Bathroom Spaces in ward and Clinic	9	310	1473	1928	3720
Rating of Waiting Area Spaces	14	686	1917	568	3185
Rating of Reception Spaces	33	816	1569	692	3110
Rating Common Room Spaces	11	500	1482	1472	3465
Rating of General Toilet Spaces	2	156	1137	2704	3999
Rating of Arrangement of Fittings Spaces	24	1010	1440	496	2970
Rating of Spaces in Praying Area	88	1172	822	316	2398
Rating of washing Spaces	7	442	1392	1784	3625
Rating of Drying of Cloth Spaces	6	256	1248	2324	3834
Rating of Cooking Area Spaces	2	130	1017	2240	3389
Rating of Spaces in Courtyard	33	1154	1137	560	2884

Table 9.0: Showing the calculation of the Likert Scale result obtained was used to determine the level of satisfaction by the users on the selected variables. The range of value for each option of level of satisfaction as follows:

1.0	-	1.49	Very Satisfied
1.5	-	2.49	Satisfied
2.50	-	3.49	Dissatisfied
	>	3.5	Very Dissatisfied

Table 10.0: Weighted Score of Users respond on Level Satisfaction in Paediatric Ward

Measured Variable	Sum	Mean	Interpretation
Rating of Nursing Station Spaces	3078	2.72	Dissatisfied
Rating of Patient Spaces	3149	2.77	Dissatisfied
Rating of Patient Relative Space	3499	3.08	Dissatisfied
Rating of Visitor's Space	3588	3.16	Dissatisfied
Rating of Circulation Spaces	3043	2.70	Dissatisfied
Rating of Furniture Spaces	3067	2.70	Dissatisfied
Rating of Storage Spaces	3133	2.77	Dissatisfied
Rating of Lobbies Space	3042	2.69	Dissatisfied
Rating of Consulting Room Spaces	3316	2.92	Dissatisfied
Rating of Toilets Spaces in Ward and Clinic	3729	3.28	Dissatisfied
Rating of Bathroom Spaces in ward and Clinic	3720	3.27	Dissatisfied
Rating of Waiting Area Spaces	3185	2.80	Dissatisfied
Rating of Reception Spaces	3110	2.74	Dissatisfied
Rating Common Room Spaces	3465	3.09	Dissatisfied
Rating of General Toilet Spaces	3999	3.52	Dissatisfied
Rating of Arrangement of Fittings Spaces	2970	2.62	Dissatisfied
Rating of Spaces in Praying Area	2398	2.34	Dissatisfied
Rating of washing Spaces	3625	3.19	Dissatisfied
Rating of Drying of Cloth Spaces	3834	3.39	Dissatisfied
Rating of Cooking Area Spaces	3389	3.51	Dissatisfied
Rating of Spaces in Courtyard	2884	2.55	Dissatisfied

It is observed from Table 10.0 that the respondents were not satisfied with the user's spaces in the paediatric ward and it could be attributed to the level of needs the respondents attached to their spaces. Likewise from the general finding drawn from table 9.0 and table 10.0, that the total average likert mean of the respondents is 2.94, and from the range of value of each option of the level of satisfaction, show that the respondents are dissatisfied. Which implied the users space needs in paediatric ward was not integrated with the design of the ward, both the space sizes and functions of the space provided.

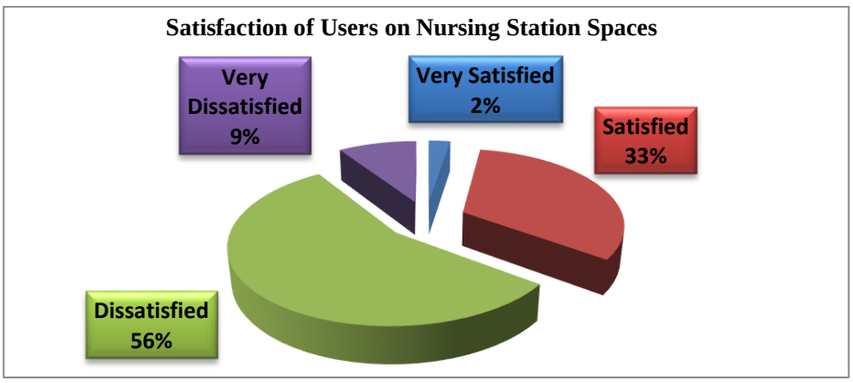

Figure 1.0: Percentage user's satisfaction of nursing station space within Paediatric Ward.
Source: Authors' fieldwork (2017)

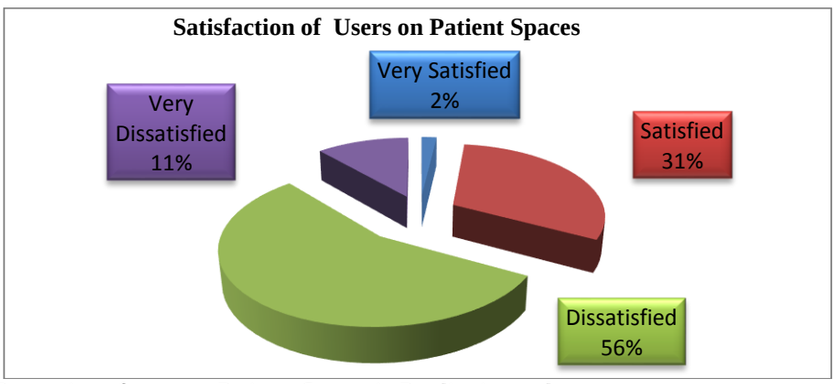

Figure 2.0: Perception of users on Patients Spaces in Paediatric ward
Source: Authors' fieldwork (2017)

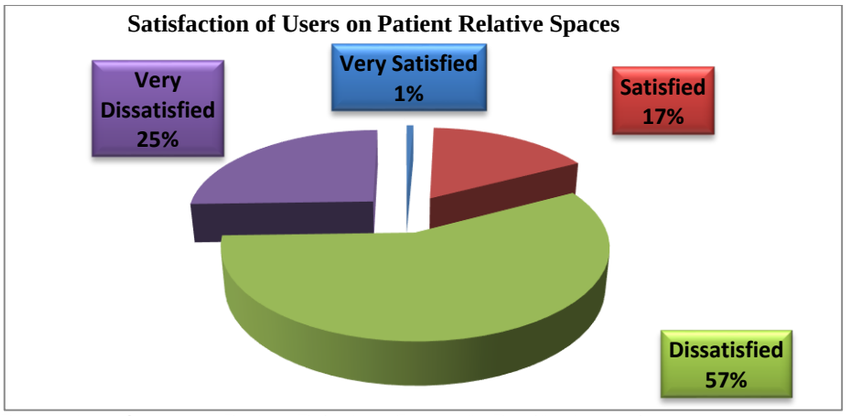

Figure 3.0: Perception of users on Patient Relatives Spaces in Paediatric ward
Source: Authors' fieldwork (2017)

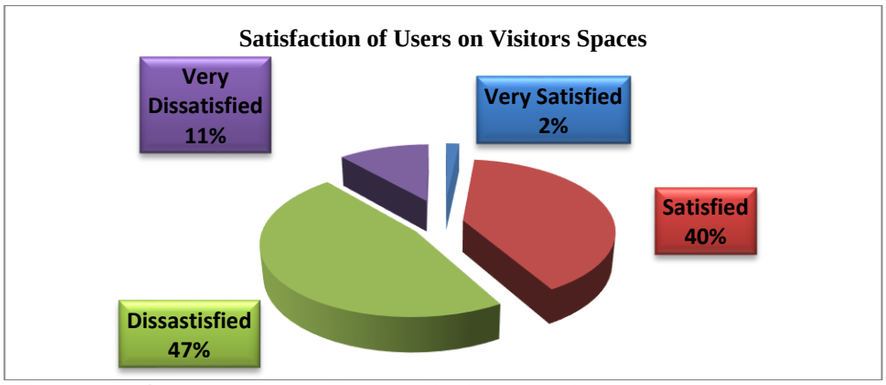

Figure 4.0: Perception of users on Visitors Spaces in Paediatric ward
Source: Authors' fieldwork (2017)

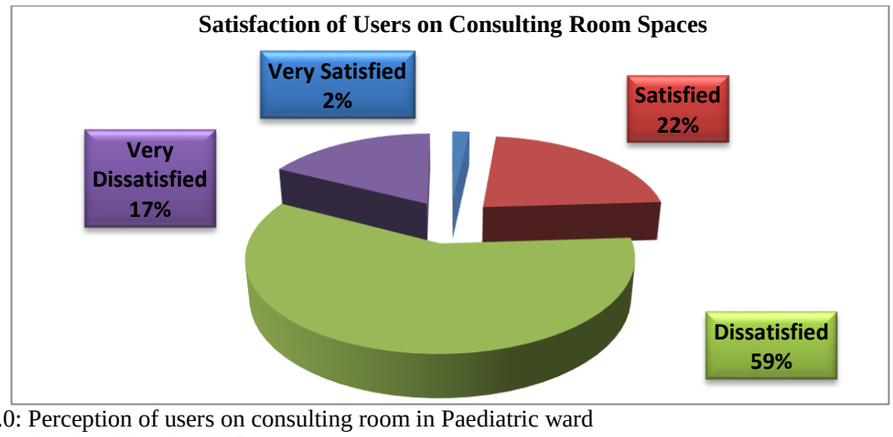

Figure 5.0: Perception of users on consulting room in Paediatric ward
Source: Authors' fieldwork (2017)

The nursing station spaces within the paediatric ward show that the users of the space are not satisfied due to the space allocated to them. Patients within the space provided to them were dissatisfied and patient relative within the paediatric ward, were dissatisfied with the space provided also. The result also showed that the circulation spaces, furniture spaces and storage spaces provided for the respondents is dissatisfied, because users of the space are hardly been considered during the design process. The consulting room spaces for the doctors and patients with patient relatives showed dissatisfied, due the lack of privacy, little or no full discussion between patient relatives and the doctors in charge. Most consulting room in paediatric ward in General Hospitals contains two doctors, due to lack of adequate space. Paediatric ward in Lapai General Hospital have this major problem. The picture below show lack of space, which result to space overcrowded. The issues of toilets and bathrooms within the ward was understandably considered by the users, the patients and patient relatives to be dissatisfied, because the space provided and arrangement of the fittings show is not highly integrated.

It becomes evident in the summary of the result from table 9.0, table 10.0, and from figure 1.0 to figure 5.0, that all the different categories of the users in paediatric ward express level of dissatisfaction with the space provided and function of the spaced in various users stations. Despite the provision of all this facilities in placed and around the ward, respondents feel the level of integration is low and lack of inclusiveness at the initial stage of the paediatric ward design.

CONCLUSION AND RECOMMENDATIONS

The major problem of users needs in paediatric ward designs in General Hospitals in Niger State is the space needs which most times limit and affect the activities of the users in finding it difficult to perform their duties conveniently, due to the level of Satisfaction. This research reveals the level of integration of user's space needs in paediatric ward design in General Hospitals in Niger State. The need for adequate space in all paediatric ward is quite high and the management of the hospitals, the department of Ministry of Health and other supporting organization need to look in the space needs of individual users of paediatric ward, the nurses' station spaces, patients spaces, patient relatives spaces, visitors space, circulation spaces, furniture spaces, storage spaces, lobbies spaces, consulting room spaces, toilets spaces, bathroom spaces, waiting area spaces, space for fittings and sections for the relatives,

to do their laundry, drying of cloth, space for cooking and after all the activities during the day, patient relative need relaxation space, a place to relax after the day activities. An important factor which the management of the hospitals needs to put in consideration is the level of integration. Integrating the users of paediatric ward right from the initial stage of the design, which will help to a certain level to know the number of nurses using the nurses' station, their need like the tables chair, size and dimension. Also the patients and patient relatives' needs, and other relevant supporting space are necessary, space to pray rest and carry out activities. The good option is for the management to begin to plan how they will introduce, inclusiveness in their design to support any users making use of the space, which is inclusive design method. This method helps to include every need of users in a particular area within and around the buildings. The most significant conclusion which can be drawn from the findings of the study, the following conclusion was made: Actually the user's space needs in paediatric ward lack satisfaction by the respondents of the ward; they should be a framework which will develop to integrate the users in the paediatric ward. This will consider the different users and their needs to carry out their functions within the ward and around the hospital.

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INTEGRATION OF OPEN SPACES IN MATERNITY HOSPITAL DESIGN FOR THERAPEUTIC FUNCTIONS IN KADUNA, KADUNA STATE

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The awareness of the positive effects of open spaces whether indoor or outdoor on patients' healing process has long been identified in hospital architecture and the integration of open spaces for the purpose of therapy has begun to be applied. This research aims to provide a new, holistic approach to maternity hospital design that involves relieving the fears and disorientation of patients (through the integration of open spaces in maternity hospitals for such therapeutic functions as these) that may hinder medical treatment. Qualitative research method was applied for this research, through the application of observation schedule and a survey. Results of this research show that 92% of the research population support and desire to see future integration of open spaces in maternity hospital design. The research recommended that open spaces should be integrated more in the design of maternity hospitals.

Keywords: Maternity, Hospital, Courtyards, Open spaces, therapeutic

INTRODUCTION

The World Health Organization (WHO) defined health in 2009 as 'a state of complete physical, mental and social wellbeing and not merely the absence of disease or infirmity'. In recent times this definition has been criticized and other definitions have been put forward—Huber et al. in the year 2011 defined health as the ability to adapt and self-manage in the face of social, physical, and emotional challenges. This agrees closely with the holistic view that sees the patient first as a person within their family, community and office, and diagnosing the positive and negative influences each can have on the person. Nursing a sick person back to better health requires due account to be taken of factors other than their physiology and anatomy; meeting psychological, social, spiritual and environmental needs are important. In 2010, Dejana Nedučin et al stated that hospitals for centuries have been concealed behind high walls, this has significantly subjected the patients' perception of the environment they feel as forced into. An environment's strictly defined borders which were progressively seen to be a segregation of 'the sick' from a healthy population, both physically and psychologically.

The cognizance of the positive effects of open spaces whether indoor or outdoor on patients' healing process has long been identified in hospital architecture (Ulrich 2002). It has become very vital to not only provide open spaces that have therapeutic functions for patients but also to create a connection between the interior of health care centres and exterior landscaping features—while one thinks of open spaces as form of landscapes that is primarily affiliated with outdoor environments, in contemporary built environments, nature has moved indoors (Mazer 2010). As a structure that is committed to the wellbeing of man, a health facility must fore mostly be an environment for healing, which helps patients and their relatives to be restored to perfect state of health.

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Therapeutic open spaces function to provide physical settings and organizational culture that support patients and families through the stresses imposed by illness, hospitalization, medical visits, the process of healing sometimes, bereavement and in this case health complications associated with maternity.

Hospitals have been criticized for their poor spatial qualities and disregard towards the patient, who is supposed to be in the genesis of its core. This research suggests the concept of open spaces to be integrated within healthcare facilities and its unique therapeutic functions. It however should not be taken lightly, because it implies that these kind of environments have to heal or at least induce healing. There are therapeutic open spaces not located within healthcare settings, but nevertheless designated as therapeutic.

If open spaces were to be considered by its meaning, significance and the impact it may have on human life, open spaces for therapeutic function is recognized with an envelope enclosing distinctive but temporary human psychologies. As patient's perception while staying in a hospital is frequently distorted, limited and influenced by various external factors, it is in constant need of a greater support than in everyday circumstances—the provision of open spaces for therapeutic reasons (Dejana Nedučin et al 2010).

Open Spaces

The term 'open space' refers to green space consisting of any vegetated land, structure, water, path or geological feature within buildings and on the edges of settlements, in civic space consisting of squares, market places and other paved or hard landscaped areas with a civic function (Brown 2008).

Open spaces can also be defined as land which are openly accessible and has been designated for either leisure, play, recreation or sport. The uses of open spaces can either be for passive or active reasons. Active open spaces are usually for sport, exercise or active play. While passive open spaces are used for sitting and relaxing. The application of passive spaces is more effective in this instance. Open spaces found within buildings and structures have significant impact on the occupants and the state of the structure as well. The presence of natural spaces nearby improves well-being and access to or views of the natural environment improve mental functioning and help in recovery from surgery and sickness (Wells 2010). These open spaces which are often characterized by the presence of high green coverage in forms of grass, shrubs and trees have therapeutic, ecological and environmental importance. Through their importance, open spaces can help people found within areas they are located in adjusting to healthy lifestyles, hence the encouragement to integrate this building feature into healthcare facilities. In recent times, there has been an increase in attention directed towards research concerning the evaluation of open spaces (including green areas and green spaces) and their components as well as their effect on the environment. Peter and Daniel (2011).

Open spaces are necessary components of structures, but poor design of an open space can lead to misuse and unused areas, undesirable behavior, strain on management, and other difficulties. The presence of open spaces in structures should be;

1. Reasonable to manage and upkeep
2. An addition to the value of the development
3. Flexible in use and therefore adaptable
4. Able to foster a sense of ownership so that residents become involved in maintaining the space
5. A positive impact on the surrounding natural resources.

The open space concept is a conceptual framework for analyzing the therapeutic effect of environments as they contribute to physical and mental health and wellbeing in places. The term “open space” was undoubtedly used for the first time in the year 1833. Turner, 1992; Maruani and Amit-Cohen (2007). Open spaces are dominated by a “natural” environment, composed of abiotic (soil, water and minerals) and biotic (plants, animals and microorganisms) elements. Maruani and Amit-Cohen (2007).

Origin of Open Spaces

Open spaces have their origin right from ancient times. A lot of research and historical descriptions provided evidence of the public open spaces (e.g. Greek holy gardens and *agoras*, the forum in Rome) used consciously by the ancient cultures—such as the Egyptian, the Mesopotamian, then the Greek and Roman—in their settlements. The significance of open spaces, as well as their importance in the settlements' evolution has been changing continually during the development of civilization.

Typology of Open Spaces in Hospitals

1. Vegetative land cover - this is characterized by the presence of green areas in-between buildings, predominantly function as waiting and eating in areas, this form of open space serve as a link between the built-up environment (architecture) and walking paths; they may however be costly to maintain.
2. Landscaped setbacks - these are generally planted areas located in the front of the main entrance of the structure, mostly for aesthetics and are visually pleasant. They serve to separate the hospital building from the road.

3. Front porches - these may comprise of extensions or porch roofs, usually areas where vehicles can pick up or drop off patients or passengers. They include sitting areas, signs with directions etc.
4. Entry gardens - they consist of visually satisfying green spaces which may have shrubs, flower beds and plain grass cover designed like gardens, to be located at the approach view of the hospital structure or entrance.
5. Courtyards - courtyards are the central and most often used spaces in a hospital building complex, as a result of their closeness to the waiting area; they tend to be used more by visitors and patients if they are easily visible, and should be satisfactorily large to prevent overcrowding (Marcus Clare Cooper, Francis Carolyn, 1997). The features in a courtyard may include landscaped tree-shaded areas, water features, flowerbeds and moveable seats—these are for reasons of privacy and security as well as aesthetics, they may be fenced around or not, if fenced they should be up to a height of 4.27m (Mental Health Facilities Design Guide. Department of Veterans Affairs, 2010).
6. Plazas - these are outdoor areas, normally paved, tiled or furnished. Made for easy access to wheelchairs, walkers and crutches. They mostly include shade from flowering trees or spreading evergreens. A plaza should have shaded seating areas decorated with plants, coloured shrubs and green ground cover, and other features like a water sprinkler system. Since these areas are mostly paved, landscaping and gardening maintenance costs are low.
7. Roof gardens - gardens that are found on roofs are visually attractive, aiding patients to look out from their rooms and have a soothing view of natural environment as grass, paving stones, benches and people, rather than roofing material or medical equipment.
8. Healing gardens - gardens which function as safe and reflective environments for therapy and restoration have their origins from the medieval period, and have over time become features of hospitals, clinics, rehabilitation centres, and nursing homes (Gerlach-Spriggs, Nancy and Kaufman, Richard Enoch and Warner, Jr. Sam Bass., 2004). The variety of activities related to healing gardens may be passive or active: viewing the garden from a window, sitting, eating, reading or taking a nap in the garden, prayer and meditation, walking to a preferred spot, gardening, exercise and sports, and children's play (Marcus, 2007). The gardens are favourable to stress relief, relieving physical symptoms, and enhancing the feeling of well-being of hospital staff and most importantly, patients.
9. The walk-in garden - in this contrast on a viewing garden, the green space can accessed from a corridor or waiting room: due to its limited space and seating, it remains a quiet area which does not disturb the privacy of any nearby rooms or offices, and also provides a calming view for people waiting or passing by in the corridor.

Plate i: Courtyard
Source: https://upload.wikimedia.org (2017)

Plate ii: Front porch
Source: www.pinterest.com (2017)

Plate iii: Plaza
Source: www.pinterest.com (2017)

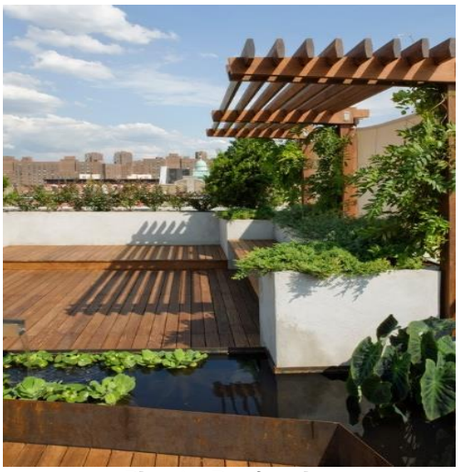


Plate iv: Roof garden
Source: http://www.southernliving.com/garden (2017)

Intricate dominant and surrounding areas of hospitals—in this case, maternity hospitals generally incline to be seen by the public as removed from the urban context, as spaces to be feared, which one can only access in emergencies or out of necessity. However, this psychological perception of their distance and separation needs to be reduced through the provision of open spaces in their design which is a better approach in construction.

In 2002, Ulrich explained that through a growing understanding of the importance of the physical environment for the quality of hospital care and the health and safety of patients and staff, open spaces in hospitals need to be considered, mostly in attractive and greener areas, as a productive balance for the areas in the hospital which are reserved for patient treatment and have traditionally been prioritized.

Since hospitals have been hidden behind high walls and fences for centuries, resulting to a substantially influenced patients' perception of the environment they feel forced into, making them believe that the strictly defined borders were clearly segregating 'the sick' from a healthy population, both physically and psychologically—there is a critical need to provide an environment that eases a patient therapeutically into good health.

Criteria for the integration of Open Spaces within Hospital areas

1. Accessibility - It is essential because people, patients, staff and users of hospital space need to be aware that the open spaces actually exist, and that they are easily accessible through entrances and paths and useable.
2. Visibility - The more open spaces are visible and people are aware of it, the more the activity areas and paths around and within it will be preferred. Patients' rooms should have views of the open spaces so that they can enjoy it even if they are unable to visit it.
3. Physiological Comfort - As hospital patients are often sensitive to temperature, options such as sunny and shady areas should be provided, as well as seating that are shielded from breeze by plants or structures.
4. Quietness – Open spaces designed for therapeutic purposes should be quiet and removed from sources of noise or sounds inside the hospital.

RESEARCH METHODOLOGY

The research methodology implemented for the purpose of this research is the descriptive survey method using case studies, observation schedules and oral interviews with medical doctors, staff and patients to evaluate the open spaces available in maternity hospitals. The assessment was conducted in Kaduna, Kaduna state, Nigeria. Four hospitals, two of which are private, one government and another of catholic administrations selected deliberately by purposive sampling of non-probability sampling method. The selection of these hospitals was based on the existence of maternity departments in their structure amongst other hospitals lacking such. The data was collected and analyzed using descriptive statistical tools such as pie and bar charts, percentages. The four hospitals selected for the purpose of this research are tabulated below:

Table 1.0: Names of Institutions sampled

	Name of Institution
1.	St. Gerard's Catholic Hospital, Kaduna
2.	Jowako Specialist Hospital, Kaduna
3.	Gwamna Awon General Hospital, Kaduna
4.	Harmony Hospital, Kaduna
5.	Sabo General Hospital, Kaduna
6.	Betheseda Clinic and Medical Centre, Kaduna
7.	Barau Diko Hospital, Kaduna
8.	Giltooe Aris Specialist Hospital, Kaduna
9.	Nasara Specialist Hospital, Kaduna
10.	Chasel Hospital, Kaduna

Source: Authors' fieldwork, 2017

FINDINGS AND DISCUSSION OF RESULTS

The results in Table 2.0 show that to a fair extent there is no total disregard of the provision of open spaces within hospital environments. It however shows that 30% of the hospitals analysed had no integration of open spaces within or around their structure. While, 70% of the health facilities observed as cases studies made provision for open spaces within their environment.

Table 2.0: Assessment of the provision of open space in the hospital environment

S/N	**Hospitals**	**Available**	**Unavailable**
1	St. Gerard's Catholic Hospital	✓	
2	Jowako Specialist Hospital		✓
3	Gwamna Awon General Hospital	✓	
4	Harmony Hospital		✓
5	Sabo General Hospital	✓	
6	Betheseda Clinic and Medical Centre		✓
7	Barau Diko Hospital	✓	
8	Giltooe Aris Specialist Hospital	✓	
9	Nasara Specialist Hospital	✓	
10	Chasel Hospital	✓	
	TOTAL	7	3
	Percentage	70%	30%

Table 3.0 shows that 80% and 50% of the hospitals studied interpret open spaces as being in the forms of front porches and courtyards—these are the most common forms of open spaces seen during the course of this research. While 60% had these open spaces in form of vegetative land cover and 30% as entry gardens and 10% as roof gardens. Walk-in gardens were however 20%.

Table 3.0: Showing the types of open spaces available within or around the hospital

S/N		**Vegeta-tive land cover**	**Landscaped setbacks**	**Front porches**	**Entry gardens**	**Courtyards**	**Plazas**	**Roof gardens**	**Healing gardens**	**Walk-in gardens**
1	St. Gerard's Catholic Hospital	✓		✓		✓				
2	Jowako Specialist Hospital					✓				
3	Gwamna Awon General Hospital	✓		✓	✓	✓		✓		

4	Harmony Hospital			✓						
5	Sabo General Hospital	✓	✓	✓		✓				
6	Betheseda Clinic and Medical Centre									
7	Barau Diko Hospital	✓	✓	✓	✓	✓				✓
8	Giltooe Aris Specialist Hospital	✓	✓	✓	✓					✓
9	Nasara Specialist Hospital			✓						
10	Chasel Hospital	✓	✓	✓			✓			
	TOTAL	6	4	8	3	5	1	1	0	2
	Percentage	60%	40%	80%	30%	50%	10%	10%	0%	20%

Table 4.0 shows that 80% of the hospitals have their open spaces at the entrance of their buildings and 50% are centrally located in forms of courtyards, while 50% provided open spaces in between built-up areas in their environments, 10% on the roofs and 40% around the structure.

Table 4.0: Location of open spaces in the hospital environment

S/N	**Hospitals**	**At The Entrance**	**Centrally Located**	**In Between Structures**	**Outdoor And Around The Structure**	**On The Roof**
1	St. Gerard's Catholic Hospital	✓	✓		✓	
2	Jowako Specialist Hospital		✓			
3	Gwamna Awon General Hospital	✓	✓	✓		✓
4	Harmony Hospital	✓				
5	Sabo General Hospital	✓	✓	✓		
6	Betheseda Clinic and Medical Centre					
7	Barau Diko Hospital	✓	✓	✓	✓	
8	Giltooe Aris Specialist Hospital	✓		✓	✓	
9	Nasara Specialist Hospital	✓				
10	Chasel Hospital	✓		✓	✓	
	TOTAL	8	5	5	4	1
	Percentage	80%	50%	50%	40%	10%

Table 5.0 shows that 60% of the hospitals studied have a visual connection between the indoor hospital rooms or wards and the open spaces within the hospital environment. While, 40% do not have any visual connection between the indoor hospital rooms or wards and the open spaces.

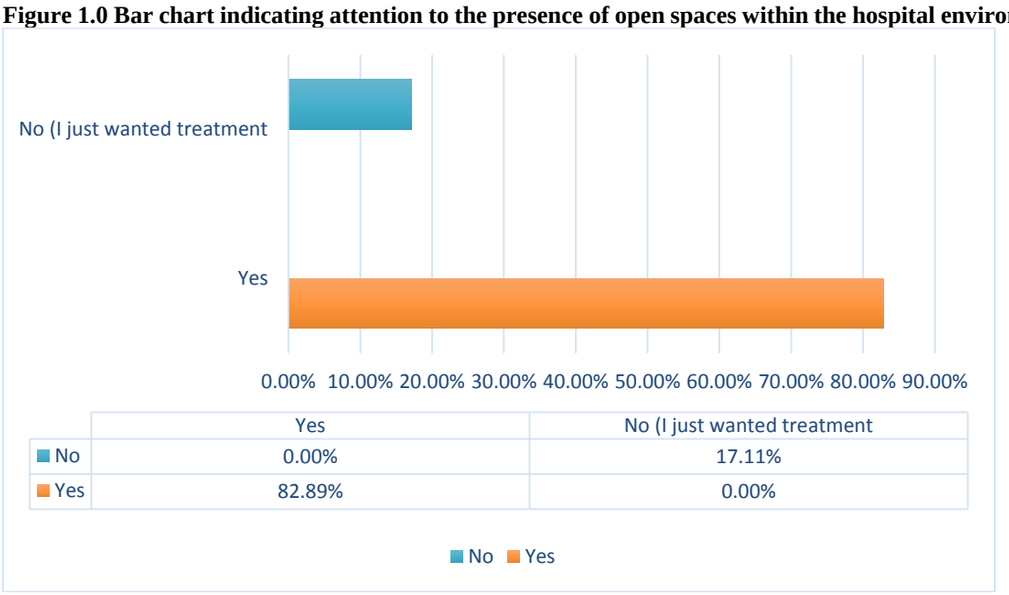
Table 5.0: Assessment of visual connection between indoor hospital rooms and the open spaces as natural environment

S/N	**HOSPITALS**	**YES**	**NO**
1	St. Gerard's Catholic Hospital	✓	
2	Jowako Specialist Hospital	✓	
3	Gwamna Awon General Hospital		✓
4	Harmony Hospital		✓
5	Sabo General Hospital	✓	
6	Betheseda Clinic and Medical Centre		✓
7	Barau Diko Hospital	✓	
8	Giltooe Aris Specialist Hospital	✓	
9	Nasara Specialist Hospital		✓
10	Chasel Hospital	✓	
	TOTAL	6	4
	Percentage	60%	40%

A survey carried out on a population of 76 people concerning the integration of open spaces into hospital environment. The data collected are represented in the following bar charts.

Figure 1.0 shows the results of the survey, 82.89% of the study population paid attention to the presence of open spaces in forms of front porches, courtyards and other forms of open spaces in the hospital environment.

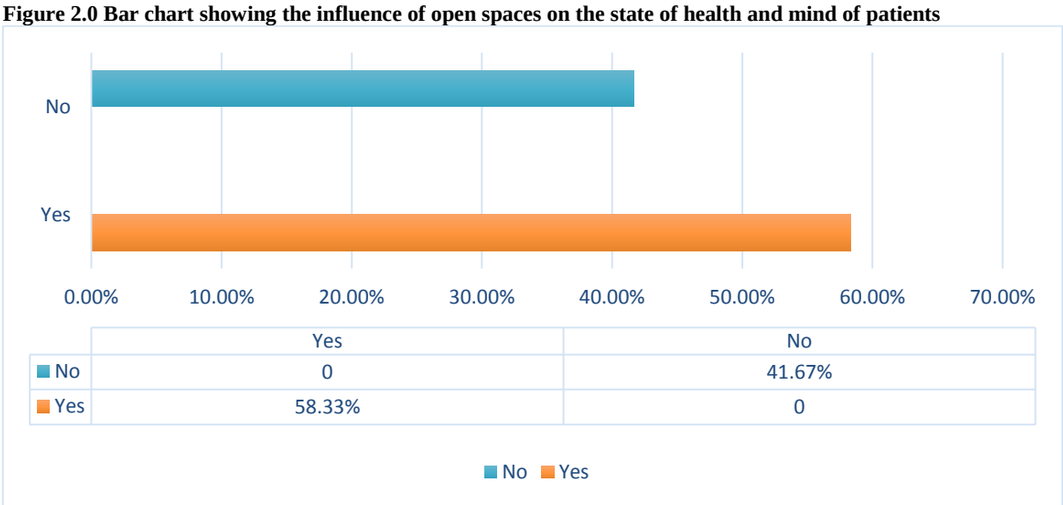
Figure 1.0 Bar chart indicating attention to the presence of open spaces within the hospital environment



	Yes	No (I just wanted treatment
No	0.00%	17.11%
Yes	82.89%	0.00%

Figure 2.0 shows that 58.33% of the study population experienced a positive influence of the open spaces on the state of their health and mind, while 41.67% felt nothing.

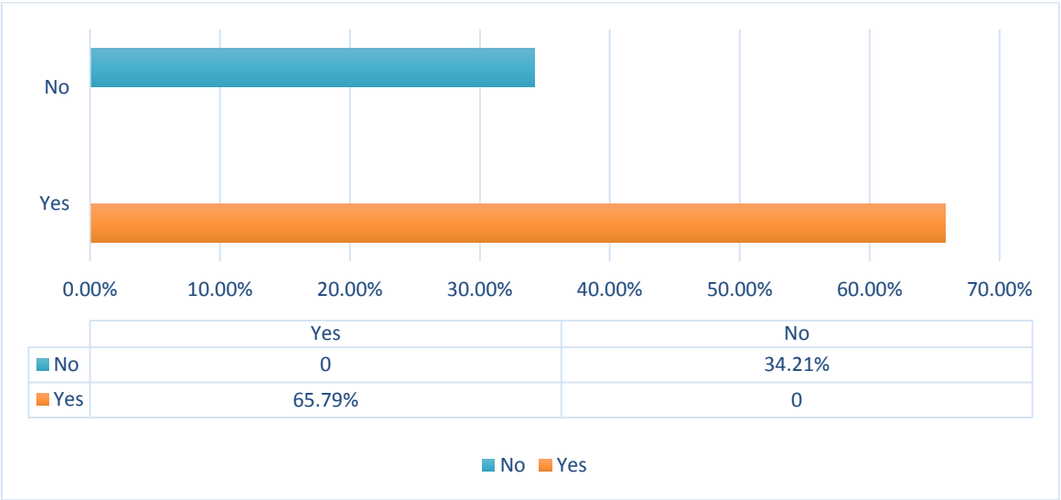
Figure 2.0 Bar chart showing the influence of open spaces on the state of health and mind of patients



	Yes	No
No	0	41.67%
Yes	58.33%	0

Figure 3.0 shows that 65.79% of the survey population believed that the presence of open spaces within the hospital environment aided their recovery while at the hospital. While, 34.21% believed the open spaces within the hospital had nothing to do with their state of health nor recovery process.

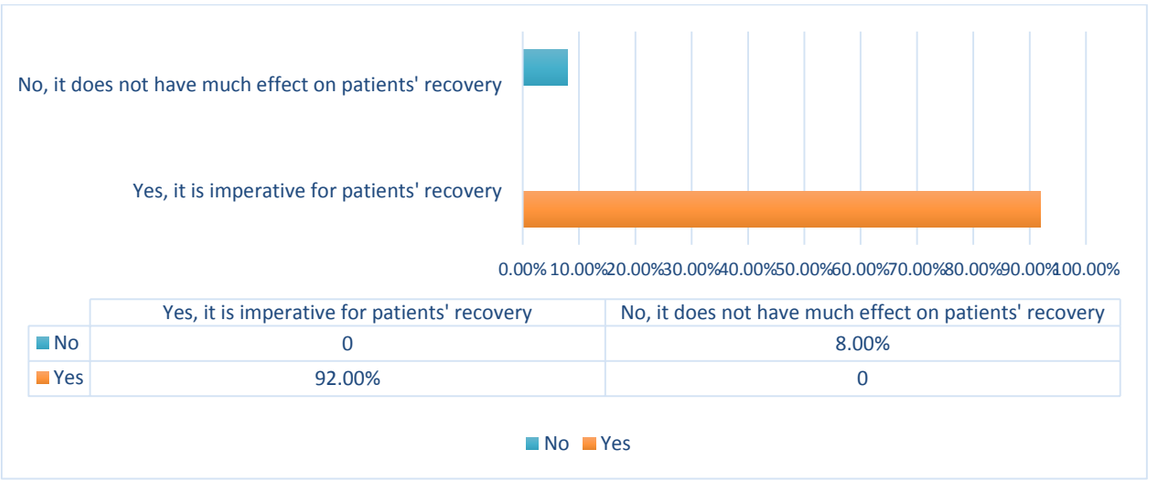
Figure 3.0 Bar chart displaying the connection between open spaces within the hospital environment and recovery process of patients



	Yes	No
No	0	34.21%
Yes	65.79%	0

Figure 4.0 shows that 92.00% of the population under survey believe that there should be future considerations of the integration of open spaces within the hospital environment because it is imperative for patients' recovery process. While, 8.00% believe it does not have much effect on the patients' recovery.

Figure 4.0 Bar chart displaying views on future consideration of integration of open spaces into hospital design



	Yes, it is imperative for patients' recovery	No, it does not have much effect on patients' recovery
No	0	8.00%
Yes	92.00%	0

Figure 5.0 covers data input of 71 out of 76 of the survey population. 15.49% of the population in view made use of the open spaces (passively: sitting in/resting/observing) within the hospital environment while admitted—everyday, more than three times a week, twice a week and once in two weeks. While a percentage of 38.08% never made use of the open spaces.

Figure 5.0: Bar chart presenting the use of open spaces provided in the hospital environment by patients

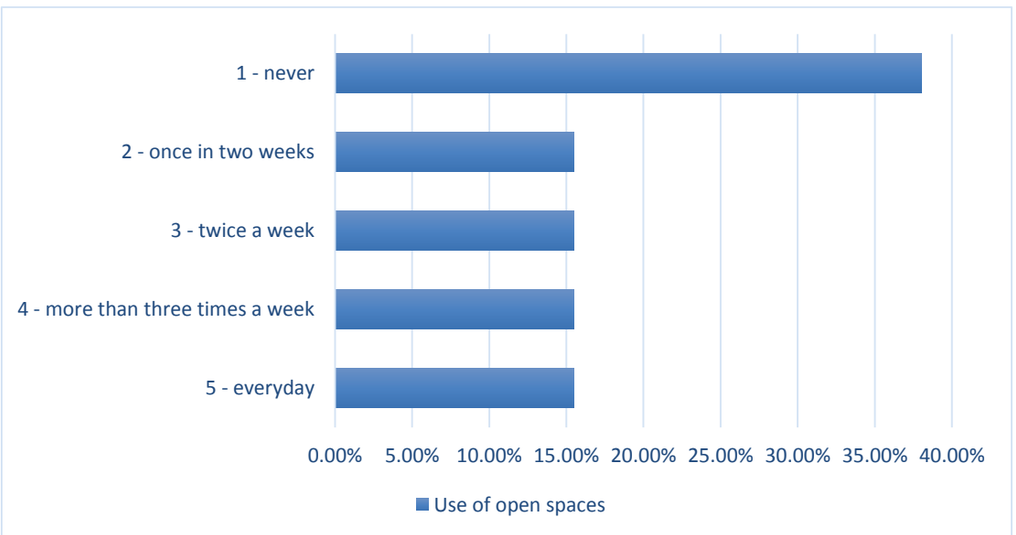
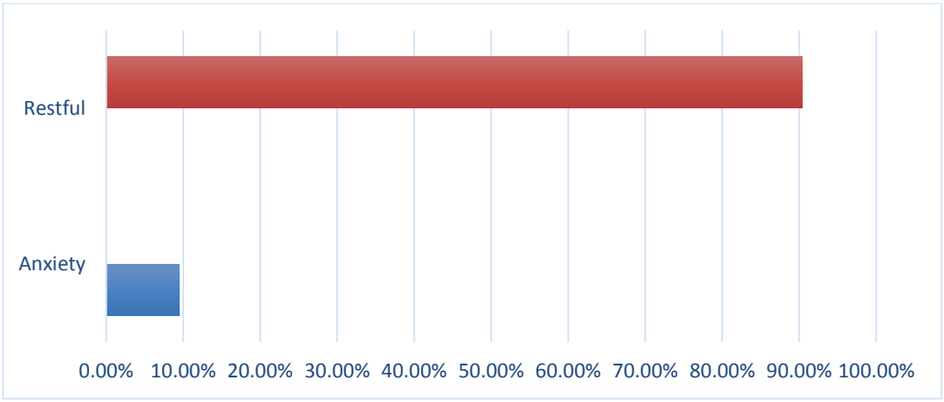


Figure 6.0 covers data input of 74 out of 76 persons that make up the survey population. It shows that 90.54% of the population associated the presence of open spaces within the hospital environment as restful and therapeutic. While 9.46% experienced anxiety while found within such hospital environments.

Figure 6.0: Bar chart representation of the state of mind and therapeutic effect of open spaces on patients in the hospital



CONCLUSION

The study has revealed that the integration of open spaces into maternity hospital design has been neglected and considered irrelevant and unconnected to the psychology of the users of hospital space, in this case, the patient, staff and visitors. It was observed that only 70% of maternity hospitals have open spaces within their hospital environment. From oral interviews conducted with hospital staff and patients, it is alarming that users of hospital spaces see no need of open spaces within the hospital environment. The survey conducted however, shows optimism towards the vitality of the integration of open spaces into the hospital environment. The design of healthcare facilities is incomplete without the integration or application of open spaces for therapeutic function and psychological balance of the patients, staff and visitors. The lack of open spaces have an effect on the patients' journey to wholeness.

Future design of hospital should not be without the provision of open spaces within and around the hospital environment. Considerations as regards to the integration open spaces within maternity hospital design should be learnt thereby creating suitable hospital environments where patients can be nursed back to wholeness both physically and psychologically.

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ADOPTION OF USER'S PERCEPTION OF LANDSCAPING ELEMENTS FOR PASSIVE SECURITY IN PUBLIC RECREATIONAL PARKS IN NIGERIA

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Nigeria, like every other country of the world, is faced with varying category of security challenges ranging from the activities of terrorist groups and kidnappers to other criminal activities. These incessant security threats have grievously impacted socio-economic development in Nigeria. To improve effective security in all potential targets; the Nigerian government in recent past has made huge budgetary allocation to security thereby starving other sectors (of the economy) of funds. In a bid to improve the secuirty of lives and properties; facility owners have increased the presence of security personnels, security alarm system and sensor gadgets and in some cases introduce landscape elements like fence, bollards, raised planters, kerbs and security lights in and around their property. Previous studies have shown that these landscape elements have security potentials which can be utilised in different open space such as recreational parks. As a follow-up, this study x -rayed visitors/users' perception on the adoption of landscape elements to provide an effective additional (passive) layer of security in open public spaces. In the survey conducted, using a five-point Likert's scale questionnaire as research instrument, qualitative data on recreational park user's perception on the use of landscape elements for security was obtained and statistically analysed. The result showed that users, although weary of security threats in recreational parks, are satisfied with the adoption; integration and utilisation of perimeter fence, bollards, hedges, kerbs and security lights to control users' circulation within the parks; to limit potential intruders and also discourage unauthorised access. It was also disclosed that users are not satisfied with the introduction of crash beams and impregnated drums before and after entrance gates. The study recommends an increased utilisation of landscape elements as security countermeasures in recreational parks since users/visitors to the parks are satisfied with its adoption. The economic and environmental advantages of landscape elements over other type of security system should also be taking advantage of.

Keyword: Adoption, Landscaping Elements, Open Spaces, Passive, Security perception, Recreation

INTRODUCTION

Daily activities of man are usually inclined towards the following: work, sleep, social duties, and leisure, the latter being a free time for recreation. Recreation as indicated by Gbadebo and Adedeji (2008), can be viewed as whatever activity or circumstance that restores, resuscitates, invigorates and recreates a person at specific times.

Recreational parks which are facilities built to encourage the rejuvenation and relaxation of inhabitants within an area has unfortunately become hideouts and hangouts for prostitutes, drug-dealers and criminals (McCormick, 2007). As observed by many researchers, crimes such as drug racketeering, prostitution, graffiti, assaults, theft, vandalism, murder, rape, trespassing, loitering and littering are associated with recreational parks (Hilborn, 2009; Groff & McCord, 2011; Pendleton and Thompson, 2000). Security is 'essentially a contested concept', because a common or unified definition will not be applicable in all cases because of the variation in peoples or groups' understanding and the context of definition (John, 2014). Security is both case- and location-sensitive.

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The alarming rate in which terrorism and other security challenges occur has made protection of persons and open public spaces like a recreational park, which are potential target, a relevant issue in our society today (Zilbershtein, 2005). According to Martinez, (2014) the protection of recreational parks from potential security challenges is very important because visitors are likely to avoid parks or venues if they are not sure of their security while Citizens Task Force, (1990), stated that there is a direct relationship between the level of park usage and the perception of security.

The different dimensions of security challenges being experienced in open public spaces has become worrisome and has greatly hampered socio-economic developments in this sector (Ewetan and Ese, 2014). These challenges have necessitated various research into security design measures for the safety of lives and properties within parks. A study by Iqbal, (2015) discovered that crimes are not evenly distributed in recreational parks within an area, but some parks are bound to experience more crimes than others based on the location and the type of activities it accommodates. Furthermore, Hilborn, (2009) asserts that it is not only the location and the types of activities that go on in a park that influences crime rate in such park, but the size of the park also has influence on the rate of crime in such parks. The perception of threat can be totally different at different levels, in different conditions, and according to the different objects being threatened, or perceived to be so.

Various active security systems like motion-sensor lights and installed bars on windows have been utilised to proffer personal and area security in built environments but landscape security design strategies have rarely been harnessed for safety. If and when utilised, landscape elements can provide an effective additional (passive) layer of security in an open public space like a park (Federal Emergency Managemnt Agency (FEMA), 2007). This study seeks to assess users and visitor's perception of/on the use of various landscape elements as security countermeasures in public parks.

Security Challenge in Nigerian Recreational Parks

According to Ukoji (2016), the incessant cases of crime and other insecurity challenges are the major problem confronting the entire world populace while Adedayo et al, (2017) asserts that terrorism is the most dreaded insecurity challenge confronting the world. Crimes in Nigeria can be attributed to the level of poverty, bad parental upbringing, greed, get-rich-quick mentality and inadequate crime control measures (Ukoji, 2016). Nigeria has security issues just like every other nation of the world (CLEEN Foundation, 2011) and this incessant security threats have grievously impacted socio-economic development in the country (Ani, 2010). The growing insecurity challenges in recreational parks ranges from armed robbery, kidnapping, drug trafficking, sex trafficking, illegal gun running, graffiti, theft, assaults, vandalizing to terrorist attacks, (Adeniyi and Bature, 2014). In recent past, crimes in Nigeria parks has manifested in various dimensions and these are generally classified into violent and non-violent crimes (Ukoji, 2016). The occurrence of the above crimes is not novel to recreational Parks around the world with Nigeria inclusive. But the unfortunate thing in the Nigerian context is that there is no proper record on the nature and extent of these crimes since crime is typically reported as both a quantity and the relative frequency of incidents (Wolf, 2010). Elsewhere in the world like the United States of America park crime records (occurrence and type of crimes) are kept and readily accessible with the help of a well-developed crime record system for parks; an example of such records is as shown in table 1.

Total Major Felony Crime Complaints by Park
April 1, 2008 – December 31, 2013

Park	Borough	Total	Murder	Rape	Robbery	Felony Assault	Burglary	Grand Larceny	Grand Larceny Auto
Alley Pond Park	Queens	56	0	1	3	1	1	49	1
Blue Heron Park	Staten Island	0	0	0	0	0	0	0	0
Bronx Park	Bronx	70	2	1	24	3	0	39	1
Canarsie Park	Brooklyn	10	0	0	2	4	0	4	0
Central Park	Manhattan	572	0	18	113	35	17	379	10
Crotona Park	Bronx	131	0	3	82	19	3	22	2
Cunningham Park	Queens	55	0	0	1	1	1	52	0
Dyker Beach Park	Brooklyn	13	0	0	2	9	0	2	0
FDR/Midland Beach	Staten Island	3	0	0	2	0	0	1	0
Ferry Point Park	Bronx	11	0	0	0	9	0	1	1
Flushing Meadows Corona Park	Queens	350	0	3	29	48	27	210	33
Forest Park	Queens	38	1	6	17	2	0	12	0
Fort Washington Park	Manhattan	9	0	1	5	1	0	2	0
Fresh Kills Park	Staten Island	1	1	0	0	0	0	0	0
Great Kills Park	Staten Island	3	0	0	0	0	0	3	0
Highbridge Park	Manhattan	25	0	2	5	6	1	11	0
Inwood Hill Park	Manhattan	15	0	1	7	1	1	5	0
Joseph T. McGuire Park	Brooklyn	0	0	0	0	0	0	0	0
Kissena Park	Queens	38	0	2	20	7	2	6	1
La Tourette Park	Staten Island	0	0	0	0	0	0	0	0
Marine Park	Brooklyn	40	0	0	18	0	1	20	1
Paerdegat Basin Park	Brooklyn	0	0	0	0	0	0	0	0
Pelham Bay Park	Bronx	40	0	1	14	8	0	16	1
Prospect Park	Brooklyn	154	1	3	73	19	7	49	2
Randall's Island Park	Manhattan	113	0	1	5	12	34	59	2
Riverside Park	Manhattan	179	0	5	77	21	2	73	1
Rockaway Community Park	Queens	0	0	0	0	0	0	0	0
Soundview Park	Bronx	15	0	1	7	3	0	4	0
Van Cortlandt Park	Bronx	43	1	0	11	4	5	22	0
Wards Island Park	Manhattan	8	0	0	0	2	4	2	0
Wolfe's Pond Park	Staten Island	1	0	0	0	0	1	2	0
	TOTAL	1993	6	49	517	215	107	1045	56

Source: New Yorkers for park

Landscaping for Security

Landscaping involves plantings of trees, bushes, and ground covers appropriately composed, chosen, introduced and maintained to improve a location, the environment of a structure, or the sides or medians of a roadway. A good security design visually conveys quality and support resident's security interest. Physical structures such as windows and gates are often called to mind first by security professional in deterring crime; but little thought or consideration has been given to how the presence of trees and vegetation could contribute to safe environments (Kuo & Sullivan, 2001). Examples of landscape elements include, Kerbs, bollards (see plate II), raised planters, guardrails, fence (see plate I), fountain and sculpture, pavements, garden seats, plants (see plates IV – VI).

The utilisation of landscape elements for security also includes both choosing particular security or barrier plant and manipulation of the physical landscape. The choice and manipulation of landscape elements to achieve the desired level of security can be attained through strict observance of layered security concept and the principles of crime prevent through environmental design (CPTED). The choice of landscape element should be guided by the general goal of the landscape design.

Plate I: Metal rail perimeter fence at Millennium park Abuja
Source: Authors

Plate II: Fixed bollards at A-Class Park and Events Wuse II, FCT Abuja
Source: Authors

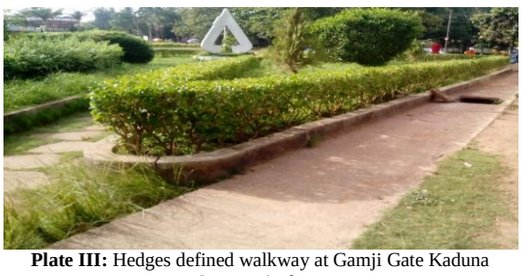

Plate III: Hedges defined walkway at Gamji Gate Kaduna
Source: Authors

Plate IV: Agave plant
Source: Colorado master Garden note 413

Plate V: Bougainvillea
Source: UN-CTAHR (2008)

Plate VI: Oncoba spinose
Composite security fence with barrier plant at City park, FCT Abuja,
Source: Author

From the forgoing, the security of a given open space can be improved through the utilisation of hard and soft scape elements of landscape. Table 2, presents a list of identified landscape elements from reviewed literatures that can be readily employed for passive security purposes in recreational parks.

Table 2: Landscape Elements that can be adopted for security purposes

S/No	Landscape elements	Materials	Location/Usage
i.	Paved circulation walkways	Interlocking stones, mass concrete, tar, timber and fibre	To define pedestrian paths
ii.	Pavements	Timber, concrete and fibre	To define boundary of pedestrian walkways or access roads so as to restrain trespassing and limit vehicular access
iii.	Speed bumps and speed humps	Tar, concrete, timber or fibre	Usually located horizontally across access road surface to limit speed limit within the park; hence delay or discourage car theft or bomb laden vehicles
iv.	Hedges/flowers	Plants	Usually found along pedestrian walkways, access road medians and road side-walks. It to define access point into activity areas thereby discouraging multiple access and exit points
v.	Kerbs	Concrete, Fibres	This is used to delineate edge roads or walkways. They are used to restrict vehicular movements.
vi.	Security light	Florescent or filament bulbs or tubes or clandestine	These are usually located in outdoor activity areas, along access roads and walkways. It discourages the creation of hideouts most especially during night hours
vii.	Vehicle Access /Exit points	Gates, opening	This refers to the gates provided for both pedestrian and mobile visitors. They checkmate accessibility of visitors/users into a facility (park) and discourages illegitimate entry
viii.	Circulation paths (meandering or direct)	Unpaved, tar, concrete, interlocking stones	Located within Outdoor activity areas. They co-ordinate and control visitor's circulation within the park hence discouraging loitering and trespassing
ix.	Bollards	Reinforce concrete, steel, fibre, wood	Usually located along the edge of roads, walkways or activity areas. Bollards act as hindrance that prevents vehicles from gaining access into certain areas. This discourages authorised access by intruders.
x.	Signage	Metal, fibre, wood	Located at strategic point within a facility to either give direction or caution. Its presence improves users confidence on their safety while using a facility
xi.	Perimeter fence	Steel, metal, wood, concrete, fibre	Fences are usually used to ensure boundaries security, basically planned to hamper or restrict trespassers or act as a barrier against explosions and hand-tossed missiles
xii.	Sculptures	Concrete, steel, metal, fibre	These are usually outdoor landscape elements. They can be used to hinder direct access to a facility by vehicles.

xiii.	Water bodies	Water	This can be located at any point but in line with the park or facility layout design. When incorporated into the boundary of a facility it discourages trespassing and when introduced as a fountain along access road it discourages direct access into a facility.
xiv.	Vehicle Parking spaces	Concrete, fibre, steel	The delineation and location of parking areas away from activity areas or facility helps to reduce or eliminate the impact of explosives.
xv.	Raised planters	Reinforced concrete	A well-articulated planter can be used as viable vehicle barrier usually reinforced to withstand the impact of a fast-moving vehicle. They are either placed on the surface or fixed to the ground.

Source: Authors

Landscape Elements and Perception

The integration and manipulation of a variety of landscape elements; like lighting in and around a property, construction of perimeter fences, bollards, pavements, and introduction of barrier plants on fences can be utilised to provide additional level of security on a given site or property although not absolute (passive) and at a cheaper cost (American Society of Landscape Architects, 2016). The above submission underlines the fact that landscape elements can be used to proffer security in open public spaces like a recreational park. But the big question which this study seeks to answer is "Do visitors/users feel secured or safe at such venues" where this landscape elements are used for security purposes? Mngutyo, (2014) in his findings affirms that perception informs people's behaviour in a venue or environment while Malec, (2003) asserts that perception of threats can vary significantly even at the personal level. According to a study by (Farbod, Kamal, & Maulan, 2017) visitors felt safer when naturalistic landscape features are used in urban parks.

According to Nor et al. (2016) and Jansson et al. (2013), women felt safe in parks with long vegetative area with clear line of sight. In a related study Muderrisogul & Demir, (2004), asserts that long view distance made by wide lawn enhances perceived safety by visitors in an urban park. According to Jansson et.al (2013), park users are afraid of parks with poor lighting, dense undergrowth vegetation or a high density of trees.

The perception of threat can be totally different at different levels, in different conditions, and according to the different objects being threatened, or perceived to be so, (Malec, 2003). Security is also a feeling, based not on probabilities and mathematical calculations, but on your psychological reactions to both risks and countermeasures, (Curiel and Bishop, 2016). Because people will ordinarily not visit a park that they termed insecure nor participate in activities organised therein, it is pertinent, therefore, for park designers and developers to explore potential visitors/users' opinions and inputs before developing any security countermeasures.

METHODOLOGY

The research method adopted for this investigation is Descriptive Research Design Method. Before administring the questionnaire used for the opinion survey; on-site observation of existing landscape elements and nature of visitors within the boundaries of the parks visited was conducted using an observation schedule list; the result obtained is as shown in figure 1 and tables 2, 3 and 6. The five-point Likert's scale questionnaire developed for the opinion survey was shared to visitors met at the time of visit to eight (8) purposefully selected recreational parks from Abuja, Minna, and Kaduna state. The needed data obtained was analysed statistically using weighted mean statistical formula and the results presented in tables and charts.

Four (4) of the eight parks visited was selected from FCT, Abuja out of the existing twenty-six (26) notable recreational parks within the metropolis; while in Kaduna, two (2) out of the four (4) existing notable recreational parks and in Minna, one (1) out of the three (3) notable recreational centres was also selected. The sampled cases were chosen using purposeful selection method owing to their usage, location and availability of landscape elements. The sample size of four hundred and eighty (480) respondents was drawn from the population of visitors as at the time (Morning: 9am -12pm, and Evening: 4pm - 6pm) of visits. Between Forty (40) and Eighty (80) questionnaires depending the volume of visitors was shared to visitors at each of the parks visited. The respondents were selected randomly by issuing a questionnaire to every fourth (4th) person or visitor contacted at the time of visit. The total number of questionnaires shared was four hundred and eighty (480) copies. Out of the four hundred and eighty questionnaires (480) shared, three hundred and seventy-eight (378) representing 76.5% was returned. Three hundred and sixty-seven (367) representing 97.1% of the returned questionnaire were correctly filled hence declared valid while eleven (2.9%) were incorrectly filled hence invalid.

RESULTS AND DISCUSSION

The need to ascertain the eligibility of potential respondents became necessary for this study so as to give credence to the anticipated result. This was projected by obtaining data on their age bracket, educational level and how often respondents visit recreational parks. The result obtained was anaylsed as shown in Figures 1, Table 2 and 4

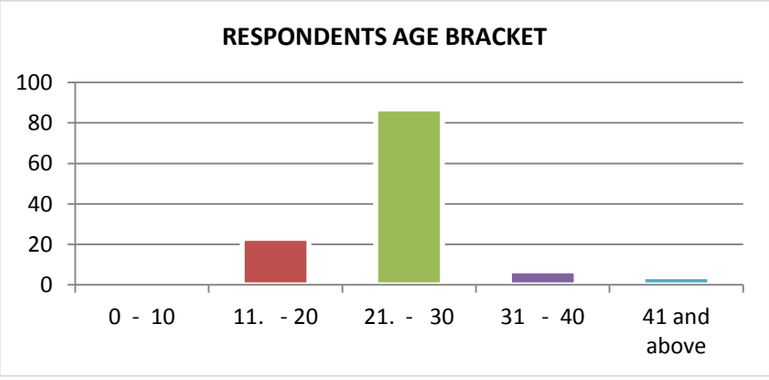

Figure 1: Respondents Age Bracket

From figure 1, shows that Seventy-one 87.72% of the respondents fall between 21 – 30 years' age bracket, 23.19% falls between 11 – 20 years' age bracket, while 4.3% falls between 31 – 40 years' age bracket. Hence it can be concluded that the respondents are of reasonable age bracket to respond appropriately to the questions contained in the issued questionnaire.

Table 3: Respondents Educational Level

Frequency		Percentage
Secondary	127	34.60%
University/Polytechnic	184	50.14%
Postgraduate	56	15.26%
Total	367	100.00%

Table 3, shows that one hundred and eighty-four (184) of the respondents are university/polytechnic degree holders which represent 50.14% of the sampled population and one hundred and twenty-seven (127) 29.75% are secondary certificate holders. Postgraduate degree holders accounted for 15.26% of the sampled population. The forgoing shows that the respondents are educationally sound to read and understand that questions contained in the questionnaire.

Table 4: How often respondents engage in recreational activities

Response	**Frequency**	**Percentage %**
Never	6	1.63%
Sometimes	240	65.40%
Not sure	0	0%
Often	70	19.07%
Always	51	13.90%

Table 4 indicates that 65.40% of the respondents visit recreational parks occasionally (sometimes) while 19.07% visits the recreational parks regularly and 13.90% of the respondents are more regular visitors to recreational parks. Form the result in Table 3, it is evident that all the respondents have visited a recreational at least once in their life time showing their eligibility to answer the questions contained in the questionnaire. The result also emphasises the need for this study, because people will not visit or participate in activities organised in parks if they don't feel secured. As a follow-up, an investigation was conducted to ascertain the security concern of visitors to recreational parks and the result obtained is as shown in Table 5.

Table 5: Respondents Security Concerns When Visiting a Recreational Park
1 = Never, 2 = Sometimes, 3 = Not sure, 4 = Often, 5 = Always

Security Concerns	FREQUENCY					Σf	Σfx	$\bar{X}$	RII	Rank
	1	2	3	4	5					
Terrorist Attack	183	70	70	19	25	367	734	2	0.40	1st
Becoming a victim of theft	234	57	32	25	19	367	639	1.74	0.348	3rd
Becoming a victim of rape	297	25	7	13	25	367	3.537	1.485	0.297	6th
Becoming a victim of bomb blast	259	45	6	25	32	367	627	1.708	0.342	5th
Becoming a victim of vandalism	240	44	51	13	19	367	628	1.711	0.342	4th
Becoming a victim of assault	221	57	45	19	25	367	671	1.83	0.366	2nd

The result on Table 5, shows that terrorist attack is the most dreaded security challenge that respondents are worried of when visiting a recreational park as it ranked first (1st) among other security challenges considered. Similarly, the fear of becoming victim of assault and theft ranked second (2nd) and third (3rd) respectively in the considered list of security challenges. Also, respondent's submission, that terrorism, assault and theft are the three most dreaded security concerns they worry about when visiting a recreational park can be termed appropriate because recreational park is a potential target where these crimes thrive. Be it as it may, the analysis showed that all the security threats considered has low rating (RII < 0.6); this entails that these threats are not a serious concern to the visitors when visiting a recreational park which is a proof that the different security countermeasures initiated and installed in this location by the government and the park administrators are beginning to yield positive fruits in restoring user's confidence level that their security is assured when visiting. Table 6 presents the landscapes elements that have been adopted for security purpose in the parks visited.

Table 6: Landscape Elements adopted for security in parks visited

Elements	Magic land Amusement Park Abuja	Millennium Park Abuja	A-Class Park / Garden Abuja	City Park Abuja	Gamji Gate Kaduna	Trappco Ranch and Resort Kaduna	Murtala Park Minna	Total Frequency
Hedges defined walkways	√	O	O	O	√	O	O	2
Krebs	√	√	√	O	O	√	√	3
Raised pavement	√	√	O	√	√	O	O	3
Paved walkway	√	√	√	O	√	√	√	5
Bollards	√	O	√	O	O	O	O	2
Garden seats	√	O	√	O	√	√	√	4
Fence	√	√	√	√	√	√	√	8
Flowers	√	√	√	√	√	√	O	5
Sculptures	√	O	O	O	√	O	O	2
Security signage	√	O	O	O	O	O	O	1

Raised planters	O	O	O	O	O	O	O	0
Security light	√	√	√	√	√	O	√	7
Water bodies	O	√	O	√	√	O	O	3
	83.33%	50 %	58.33%	33.33%	66.67%	41.67%	41.67%	100%

The potentials and benefits of using landscaping elements to proffer passive security in open spaces have been observed to be effective and economical (American Society of Landscape Architects, 2016), if and when adopted for security purposes. The credence given to its effectiveness in deterring unauthorised access and intruders informed the decision to conduct this investigation on the perception of users on its usage. An opinion survey was conducted in the study area to ascertain users' perception on the use of landscape elements for passive security purposes. The questions asked were subjective in nature and were developed from the observed security potentials of landscape elements stated in table 2. Respondents are to tick any of 1 to 5 accordingly with respect to their perception on the usage of landscape elements for security. The result obtained is as shown in Table 7. *(1 = strongly disagreed, 2 = Agreed, 3 = Not sure, 4 = Agreed, 5 = Strongly Agreed)*

Table 7: Respondent's satisfaction on the use of landscape element for security in recreational parks.

Landscape Elements	**FREQUENCY**					**Σf**	**Σfx**	$\overline{X}$	**RII**	**Rank**
	1	2	3	4	5					
Kerbs stone are good barriers for vehicles	19	32	69	146	101	367	1379	3.76	0.752	8th
Paved walkways discourage straying within a park	13	19	32	164	139	367	1498	4.08	0.816	5th
Planting of Flowers and hedges along walkways can be used to discourage trespassers	44	38	70	107	108	367	1298	3.54	0.707	12th
Having direction, caution and safety signs around the park premises improves users' security awareness.	19	19	38	95	196	367	1531	4.17	0.834	4th
The planting of thorny-flowers along park fence-line discourages unauthorised access into the park.	13	25	13	146	170	367	1536	4.19	0.837	3rd
The introduction of speed bumps on park access road discourages car theft and delays bomb laden vehicles	32	25	32	95	183	367	1473	4.01	0.803	6th
The introduction of impregnated drums before or after park entrance gate discourages or delays car theft.	26	107	82	107	45	367	1139	3.10	0.621	18th
The location of vehicle parking area far away from the activity areas of the park discourages vehicle bomb attack.	19	32	25	190	101	367	1423	3.88	0.775	7th
The use of pavements to define pedestrian circulation paths discourages trespassing and loitering within the park	13	57	88	171	38	367	1265	3.45	0.689	15th
The introduction of crash beams before or after park entrance gate discourages unwanted vehicular access into the park	25	38	108	171	25	367	1234	3.36	0.672	17th
The introduction of bollards around park activity areas; discourages and delays forceful entering by bomb laden vehicles.	25	38	44	228	32	367	1305	3.56	0.711	10th
Having Ponds and fountains or river(s) around or within a park discourages loitering and unauthorised access.	19	51	95	164	38	367	1252	3.41	0.682	16th
The introduction of change in ground levels for different activity areas in the park discourages car theft in parks	32	32	63	183	57	367	1302	3.55	0.71	11th
Garden seats can serve as good barriers to pedestrian and vehicles within a park	6	63	82	184	32	367	1274	3.47	0.694	14th
Ditches decreases the rate of car theft in parks	25	44	64	190	44	367	1285	3.50	0.700	13th
The introduction of security light in parks has decreased the rate of crime at night in recreational parks	19	13	13	114	208	367	1580	4.31	0.861	1st

The introduction of perimeter fence along park boundary line has helped to decrease the rate of crimes in parks	6	32	19	139	171	367	1538	4.19	0.838	2nd
The introduction of guard-rails along walkways helps to reduce the rate of authorized access to activity areas and discourage theft in parks.	19	53	32	192	71	367	1344	3.66	0.732	9th

From the result shown in Table 7, the relative importance index (RII) of the analysed response shows that all the listed landscape elements that can be used for passive security purposes in recreational parks has high rating ($0.6 \leq RII < 0.8$). This is a reflection of the impact of the various security measures that have being put in place by park administrators and managers to limit the growing security challenges in the park.

However, the use of security light to illuminate the park at night, ranked first (1^{st}) as the passive barrier element that has the highest influence on security of lives and properties in a park. Next to it is the introduction of perimeter fence around the park to prevent easy access by unauthorised vehicles and individuals into the parks, then, the use of flowers to define circulation paths which ranked 3^{rd}. Also, the result shows that the introduction of impregnated drums before and after the entrance gates of parks ranked 18^{th} which shows that this element although useful is not satisfactory to the respondents as a means of fostering protection.

CONCLUSION

Safety and security of individuals going to recreational parks and other open space facilities should be well-thought-out as it is a determinant factor of participation for individuals intending to participate in events organised in such open public spaces.

From the study, terrorism, assault, theft, rape, graffiti, and vandalism are some of the identified security challenges associated with recreational parks and its resulting effects have discouraged legitimate users and hindered socio-cultural development of parks within the nation. However, like Honey, (2000) affirmed, having a park professionally landscaped following good landscape design principle can help restrict and control pedestrian and vehicular circulation and access as well as prevent unwanted trespassing. Also, the adoption of the principles of CPTED and the concept of layered security in park layout design, choice and placement of landscape elements within the park will help to develop different security reinforcing borders or rings and surveillance that will either discourage potential intruder or delay an intended security breach (AIA, 2001, Bush 2003, FEMA, 2003).

The results of the survey carried out shows that visitors to recreational parks at one point or the other are security conscious even while seeking fun. Terrorist attack is the most dread security concerns that visitors are weary of while visiting parks; followed by theft and assaults. This consciousness and the need to safeguard visitor's life and belongings while seeking fun has led to the adoption of various passive security countermeasures in the parks visited. Perimeter fence was the most-adopted landscape elements and equally perceived by visitors to be very needful and useful in recreational parks after security lights. From the perception survey conducted as shown in table 7, results showed that all the landscape elements considered have high relative importance index (RII) of ≥ 0.6 which clearly showed that the visitors accept and are Ok with the use of the identified landscape elements as security countermeasures in recreational parks.

The security potentials of landscape elements should be effectively adopted and utilised to mitigate the growing security issues associated with recreational parks but not on a stand-alone basis because no security system is infallible. Also, its (i.e. landscape elements) economical and health benefits can also be taken advantage of when compared with other security systems.

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ASSESSING FLEXIBLE FEATURES IN THE DESIGN OF EVENT CENTRES IN MINNA, NIGER STATE NIGERIA

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Flexibility overtime has been known to enhance the peculiarity of a space, making spaces adaptable to multipurpose use, without altering the functional requirements. The design features and techniques that allow for changing situations in the use and operation of spaces were the focus of this paper. Components such as walls, floors and roofs are the design features that affect space in any building. Event centres being hubs for cultural and social activities, attract an unpredictable population, hence the need for flexible venues for event centres which are fast becoming stable and developing features of any city. The study assessed available event centres and the design features used to achieve flexibility, examining their adaptation to inadequacy of event spaces in selected event centres in Minna Niger state. Observation schedules were used as instruments to obtain data and data collected was then analysed using Microsoft excel. It was observed from the study that all event centres studied had adaptability as their flexible design approach and this is as a result of the use of large open spaces, however 80% of event centres in Minna, Niger state failed to have flexible design features. The 20% that provided few of these features used curtain as flexible design elements. The paper recommended that design features for flexibility such as moveable walls, retractable roofs and sitting should be used in event centre designs to achieve an effective flexible design.

Keywords: Adaptation, Design features, Event centre, Flexibility

Introduction

According to Ran (2000), Architecture is about concepts and design decisions made to enable effective satisfaction of a software system's quality requirements. The degree to which a system supports possible or future changes to its requirements is what is known as flexibility (Bass, et al., 2003). Flexibility in architecture seeks to provide required space by means of simply changing the space at different times in order to adapt itself with the required function in different times. Flexible spaces could be identified and restricted through design features such as floors, ceilings and walls and these should be designed in a way that changes flexibly. A space may be required to be shrunk or expanded and since these design features identify and restrict the space, they should be designed for dissociation or separation to achieve a flexible space. Demountable structures using a design method of splitting a structure into smaller sections called modules that can be independently prefabricated and used to form different structures can be adapted to achieve a flexible design. An event centre offers a multipurpose space where events with a huge amount of people take place like exhibition halls, conference centres, exposition centres and convention centres. Flexibility and adaptability are key factors required in these spaces in order to be subdivided into various sized spaces as the case may be. These sizes expand the design possibilities for demountable structures using modular construction. Each module can be attached, detached, modified, relocated and replaced easily for upgrading, repair, recycling and reuse.

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Design Features in a Building Structure

Design features are the distinguishing characteristics or unique component parts that, together, form the houses, buildings and structures. According to NEHRP (2010), a building includes the structure itself and the non-structural components attached to and supported by the structure. For a basic structure, the walls, floors and roofs make up these features and components.

Walls

Walls are vertical structural elements used to divide or enclose and in building construction, to form boundary of a room or a building. They are the physical barriers that provide privacy, security, and fire and sound separation. In traditional masonry construction, they support the weight of floors and roofs but modern steel and reinforced concrete frames, as well as heavy timber and other skeletal structures, require exterior walls only for shelter and sometimes distribute with them on the ground floor to permit easier access (Masonry Institute of British Columbia, 2015). Positioning of walls depend on type of support given floor and roofs. These walls can be categorised according to their functions; load bearing walls and non-load bearing walls. According to Mahendra (2011), load bearing walls are part of the structure of a building, that bears a load resting upon it by conducting its weight to a foundation structure, and their maximum length establishes the distance between them. Materials often used to construct load bearing walls in large buildings are concrete, blocks or bricks. Non-bearing walls are partition walls that are used to divide rooms, used where loads are carried by beams, or other members, and are sometimes referred to as curtain walls; they are attached to the frame members. Any durable, weather-resisting material such as glass, plastic, metal alloy, or wood may be used, since non-bearing walls are freed from the limitations of structural requirements (MIBC, 2015).

Floors

Floor is regarded as the lower enclosing and supporting surface that extends horizontally throughout a structure. It forms the bottom of a room and divides space horizontally into stories. According to Federal Emergency Management Agency (2010), Floor systems form a horizontal partition at each level where they occur and transfer load to braced walls below that floor level or directly to the foundation when the lowest floor is supported on a foundation. The floor assembly must support its own dead load plus furnishings and the live load of occupants engaged in any variety of activities. The horizontal supports beneath its top surface-and the vertical supports with which they intersect to form a frame must be sufficiently large and spaced closely to prevent sagging of the assembly. Materials used for floors range from compacted soil to reinforced concrete (Mahendra, 2011).

Roof

Roof is the covering of the top of a building, serving to protect against rain, snow, sunlight, wind and extremes of temperature. In many buildings, the roof is a major element that gives the building its characteristic profile (Architectural Heritage protection, 2004). Roofs have been constructed in a variety of forms as dictated by technical, economic or aesthetic considerations.

Overview of Flexibility

According to Kronenburg (2007), humans are flexible beings and the survival of humans as a species was due to man's capacity of changing, to be adaptable and movable. Man's curiosity to explore and accomplish new goals showed that humans are dynamic and have dynamic behaviours. A simple cave could be enlarged, changed in shape, have another chamber added to it behind, to one side, above or below, linked by ramp, stair or doorway, and then another chamber beyond that, perhaps, in a different direction, or branching off from one of the new chambers, thereby adapting to existing needs (Kahn & Easton, 1973).

In 1914, Domino house was designed using the principle of "Plan Libre" which was one of the quintuple principles proposed by Le Corbusier modern architecture, in the early 20th century. The plan was an open design, having no internal walls except for space partitioning, column supports and stairs to connect levels together. Internal walls could be placed wherever required so that spaces can be shrunk or expanded, this idea offered freelance in designing the spaces and bringing flexibility for spaces.

Fig. 1.0 The idea of plan libre
Source: Arch 570- Informal Studies on Housing II (2012)

Flexibility has inspired creativity worldwide due to its outstanding characteristics of adaptability, mobility, and transformability. It is an important concept that has entered contemporary architectural world and this is because it brings about the possibilities of portable, prefabricated, demountable, dynamic, adaptable, mobile structures and thereby rapidly becoming a trend in modern day architecture. Buildings no longer represent a static categorised order: instead, they have become flexible containers for use by a constantly changing society. Flexible buildings are intended to respond to changing situations in their use, operation and location (Kronenburg, 2007). They can evolve from a reality to another and accommodate new purposes and needs and the possibilities are vast and limitless. Flexibility means it is not static, rather, it is movable, adapts to change and transforms (Argency, 2012).

Flexibility in the design of buildings

Flexibility in the design of buildings is adapting a concept where buildings can adapt to current and future needs ranging from economic concerns, to sustainability and the possibility of change and also allows the division of the space according to the needs of the user. Flexibility in buildings is designing for changing requirements and arrangements (Schneider and Till, 2005). In order for a building design to be flexible, the following must be considered: adaptability, mobility and transformability.

Adaptability

Every building should be designed to have the ability to alter to changes or be changed to fit current circumstances. In architecture, change is inevitable therefore having a building with elements that allows for change to happen is the major concern so that while a building has a distinct purpose, it can operate as multipurpose. A space capable of meeting different requirements by simply changing of furniture, without any further modification can be seen as an adaptable space. The open building approach considered the most formalized approach for adaptable architecture. The flexibility of the building design allows for users and occupants to choose own designer, and freedom for the designer to create the desired space the client needs. An example of adaptable building is the Schlaulager (Art Store) in Basel which combines storage, exhibition spaces and art research institute. The storage concept ensures that works remain accessible unlike in a typical museum situation where art not on display is crated up and locked in a vault.

Plate I; Schlaulager (Art Store) in Basel Source: google image (2017)

Mobility

According to Andrei (2002), mobility of buildings representing the physical movement of a building that changes places within a time range. Relocation according to specific needs is the basic idea behind mobile structures all over the world. This was practised by the nomadic communities who take their dwellings with them. Mobile structures are usually demountable buildings that promote movement and flexibility of space, widely used in a number of fields such as in commerce, industry, military, education, health care, housing, where they fulfil their individual roles. Flexibility in the design of buildings, using mobile design is related with the possibility of designing temporary accommodations in critical and emergency

situations such as in war and conflict areas or in relation to natural disasters. Mobility of buildings gives rise to efficient use of materials and resources making it important for flexibility.

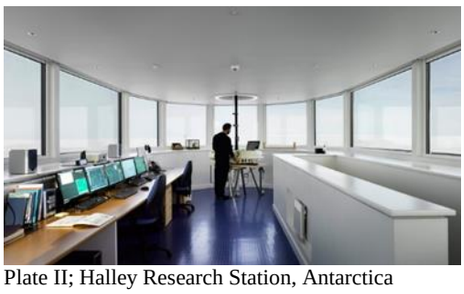

Plate II; Halley Research Station, Antarctica Source: google image (2017)

Transformability

Transformability in buildings enables a building to change its shape, space and appearance by the physical modification to its basic components, outer shell or internal surfaces. This transformation enables a building to open, close, contract or expand, making it a critical aspect of flexibility in buildings (Kronenburg, 2007). The transformation operation can be done manually by disassembling and assembling of different building components, or by mechanical means using a button to control the movement of parts and change of form of a building. An example is the M-House made by Architect Jantzen as seen in plate III which consist of a series of rectangular panels that are attached in hinges which allows the panels to fold to perform various functions and this structure could be assembled and disassembled.

Plate III; M-House By Michael Jentzen Source: google image (2017)

Transformable buildings also have the ability to interact with external environment removing the barrier between inside and outside and respond to climatic situations thereby contributing to sustainability. Components can be opened or closed depending on the purpose and desire of the user. An example is the Starlight Theatre in Illinois as seen in plate IV.

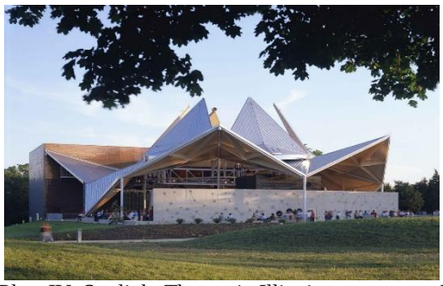
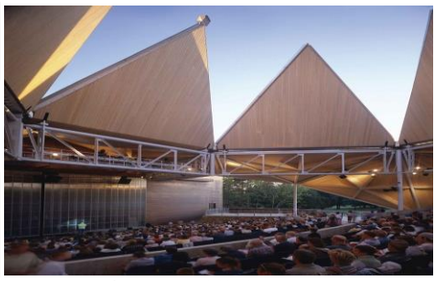

Plate IV; Starlight Theatre in Illinois Source: google image (2017)

Flexibility of Design Features

The flexibility of the design components that forms a structure is the basic factor that determines how flexible a structure can be. These design features can easily be identified and assembled to enable realize, create or modify the change requirement. The breaking down of these components that can be disassembled non-destructively from the product as a unit is referred to as modules and each module can be attached, detached, modified, relocated, and replaced easily for upgrading, repair, recycling, or reuse. Demountable structures include modular design which serves as basis for adaptable, mobile and transformable design. The function-based modular design offers flexibility and allows maximum space utilization and functions to satisfy the needs of different groups of users.

Basic elements of design features

Moveable and folding walls

Movable walls are specified where functional space demarcation is an essential element within the partition project. Demountable and movable partitions should be used in areas susceptible to future partition rearrangement. Due to their flexibility and cost effectiveness they allow large rooms to be conveniently sub-divided to maximise space utilisation. Compared to traditional wall construction, installation of these partitions are faster and eliminate the cost and mess of cutting and fitting carpet and ceilings around fixed walls. They offer maximum flexibility and reusability to accommodate frequent and quick relocation of work without loss of materials, damage or modification to panels or to adjoining structures such as ceilings, fixed walls and floors. Movable partitions and some demountable partitions are non-progressive allowing the removal of individual panels from any location without disturbing adjoining units. Partition layout should be based on module configuration to allow for maximum reusability. Standard applications include office interiors, meeting rooms, sports and leisure facilities, schools, colleges, churches, conference and function suites, exhibition centres, banks and restaurants. The versatile system can be quickly and easily operated to provide division of room space for meetings, events or activities allowing separate areas to be used without disturbance from each other or opening up to one large room when needed.

Plate V; Folding and moveable doors used as partitions Source: google image (2017)

Moveable and Retractable Seating

The seating platforms are used in a range of facilities including performing art centres and theatres where there is a requirement for seating areas and floor space to be racked. Due to their flexibility and cost effectiveness they allow large rooms to have different floor levels for multi-purpose use. The benefit of this is that it maximizes use of venue space, multiple uses within the one facility and provides optimum viewing for the audience. The types include: fixed, recessed, mobile and travelling seating as seen in figure 1.0 below:

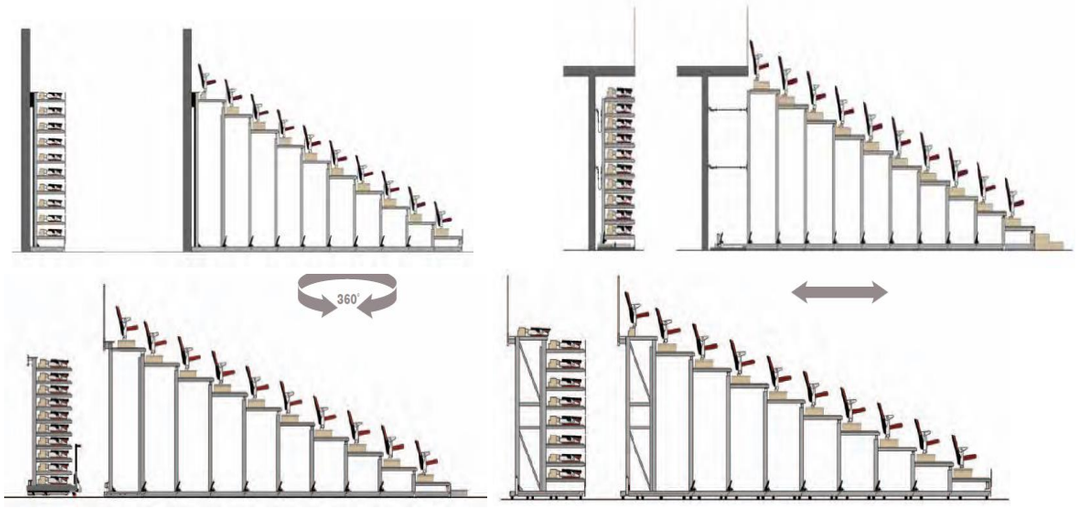

Fig. 1.0 Types of retractable seating
Source: www. .irwinseating.com and www.starenaaust.com (2013)

Moveable and Retractable Roofs

This is a roofing system designed to roll back on tracks so that the interior of the facility is open to the outdoors. The development of this roof structures originated from ancient times when Romans covered their buildings intended for mass events (amphitheatre, theatre, and

circus) with foldable awnings. They used simple retractable systems (wooden beams, ropes, canvas) for unfolding the roof above stands and thereby shielding users from a variety of weather conditions (Andrej, 2015). Retractable roof structures are a type of roof structure, which can be completely or partly moved or folded in a short period of time so that the building can be used with an open or closed roof" (Ishii, 2000). Retractable roofs are used in residences, restaurants and bars, swim centres, and other facilities wishing to provide an open-air experience at the push of a button. They vary in shape, material and movement and could be categorised based on frequency of opening and closing, structural design, type of movement, size of movable roof elements, and type of moving system. The Wembley football stadium in London is one of the many examples of retractable roof structures as seen in figure 2.0

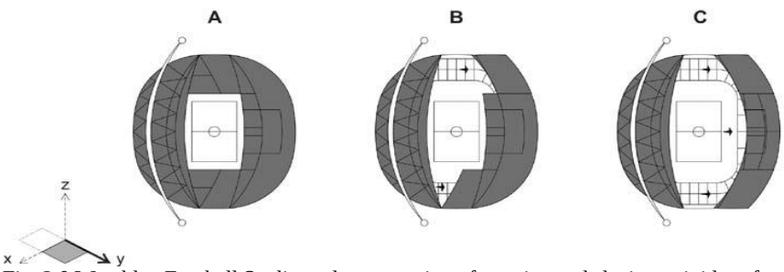

Fig. 2.0 Wembley Football Stadium; demonstration of opening and closing a rigid roof structure (A - closed, B - half-open, C - open).
Source: www. .iu-cg.org (2015)

Overview of Event Centres

According to Brisbin (2016), event centres are major public assembly facilities that attract people of all ages, social backgrounds and interests. It is often regarded to as multi-purpose facility used for activities ranging from sport to entertainment spectator arenas, extending to community and cultural celebrations, religious to motivational venues; the contrast and diversity of events is infinite. Event centres being hubs for cultural and social activities, attract an unpredictable population, thus these centres are to be designed to allow participants and audience to engage in distinct ways. Event centres are facilities that host variety of events which change with what society wants, therefore, the need for these facilities to be sustainable to last a long period of time and flexible to adapt to change. Event centres should be able to create a sensation, entertain, be aesthetically pleasing and able to accommodate different modes of participation.

Types of event centres

Permanent

A permanent event centre is one which is attached to the ground for a foreseeable future. It is usually planned and designed to remain in a particular location. There are usually constructed on site, or components could be prefabricated and assembled on site.

Plate VI; Shehu Musa Yar'adua Centre, Abuja and Civic centre, Lagos
Source: www.nigeriagallerria.com (2017)

Temporary

A temporary event centre is one which is not attached to a permanent foundation. It is usually used where the is uncertainty concerning future space requirements or expansion plans. There are usually relocatable therefore can be dismantled and removed when it is no longer needed at a convenient time. A temporary event centre is also sustainable because materials are reusable and recyclable and energy usage and cost are kept to a minimum. Plate VII shows a temporary event structure

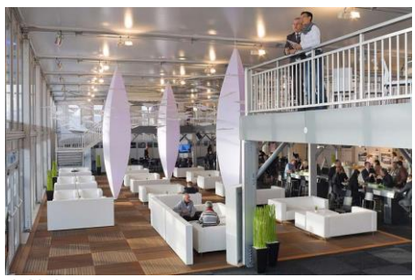

Plate VII; Shehu Musa Yar'adua Centre, Abuja and Civic centre, Lagos
Source: google image (2017)

RESEARCH METHOD

Observation method of research was employed. Observation method of research involves directly observing and studying a sample of a population. The survey was conducted by directly observing the number of spaces provided in the event centres, with its types of structures and event spaces provided and the flexible design features and approach adopted in the selected event centres. The observation schedule was designed to reveal types of event centre structures and event space available, availability of flexible design elements, types of flexible design features and approach used.

The importance of Minna has been further enhancing with the movement of the seat of federal government from Lagos to Abuja in 1992. Minna is about 120km to the west of Abuja; it is the closest state capital to the federal capital territory. Since then both the population of Minna and it economic land space have impact on spatial extent of the town. The population was divided into two local government areas which comprise Minna city namely: Bosso and Chanchaga. Event centres were selected based on the geographical areas which make up Minna city using area random technique as indicated in table 1.0. A sample size of ten (10) event centres in Minna, Niger state were drawn from a total population of fifteen (15) event centres within the study area. Minna city have established event centres in the two local government areas that makeup the state capital. However, each of the local government areas have at least one or more of event centres, making the sample size drawn to be 66.6% of the total population of the study.

Data analysis took the form of simple descriptive statistics and content analysis represented in the form of percentages. Data collated was computed manually and tabulated in Microsoft Excel Spread Sheet Program. Component bar charts and pie charts were used to represent the frequency distribution

Table 1.0: Event centres studied categorised into local government areas

S/No.	Name of Event centre	Local Government Area
1	Abdulsalam Youth Centre	Chanchaga
2	COE Multipurpose Square	Chanchaga
3	Nasfah Hotel	Chanchaga
4	Uk Bello Art & Culture	Chanchaga
5	Vagosh Event Centre	Bosso
6	Legbo Kutigi Conf. Centre	Bosso
7	Gidan Matasa	Bosso
8	St. Michael Catholic Hall	Bosso
9	Posh Event Centre	Bosso
10	Athena Event Arena	Bosso

Source: Authors' fieldwork, 2017

RESULTS AND DISCUSSION

The results obtained from the observation schedule showed the number of event venue available at each event centre, this was represented in tables 2.0 where it was observed that 60% of the population had a single building for event venues, while a total of 40% had more than a single venue with 20% having more than four venues for events at their centre. This showed that event centres with a single venue did not provide spaces for different population, whereas those with 4 or more buildings provided various spaces for different population, hence should be adopted for this research.

Table 2.0: Number of event venue available

S/No.	Name of Event centre	Number of Event venue			
		1	2	3	4/more
1	Abdulsalam Youth Centre				✓
2	COE Multipurpose Square	✓			
3	Nasfah Hotel	✓			
4	Uk Bello Art & Culture		✓		
5	Vagosh Event Centre	✓			
6	Legbo Kutigi Conf. Centre			✓	
7	Gidan Matasa				✓
8	St. Michael Catholic Hall				
9	Posh Event Centre	✓			
10	Athena Event Arena	✓			
	TOTAL AVAILABLE	**6**	**1**	**1**	**2**
	PERCENTAGE	**60%**	**10%**	**10%**	**20%**

Source: Authors' fieldwork, 2017

In assessing event spaces available, it was observed that a total of 90% of the event centres studied were indoor spaces, 30% of this also had outdoor spaces, but 10% of the population had only outdoor spaces for events as seen in the table 3.0. Deduction from the result obtained shows that an event centre design should have provision for both indoor and outdoor events.

Table 3.0: Types of event spaces available

S/No.	Name of Event centre	Event Space available		
		Outdoor	Indoor	Both
1	Abdulsalam Youth Centre		✓	
2	COE Multipurpose Square	✓		
3	Nasfah Hotel		✓	
4	Uk Bello Art & Culture			✓
5	Vagosh Event Centre		✓	
6	Legbo Kutigi Conf. Centre			✓
7	Gidan Matasa			✓
8	St. Michael Catholic Hall		✓	
9	Posh Event Centre		✓	
10	Athena Event Arena		✓	
	TOTAL AVAILABLE	**1**	**6**	**3**
	PERCENTAGE	**10%**	**60%**	**30%**

Source: Authors' fieldwork, 2017

The predominant structure used for event centres in Minna as observed is permanent structure which was 60% of the research population while 30% had temporary structure and the other 10% had provision for both as represented in figure 3.0. Due to the fact that majority had permanent structure, it shows that these event centres were not flexible.

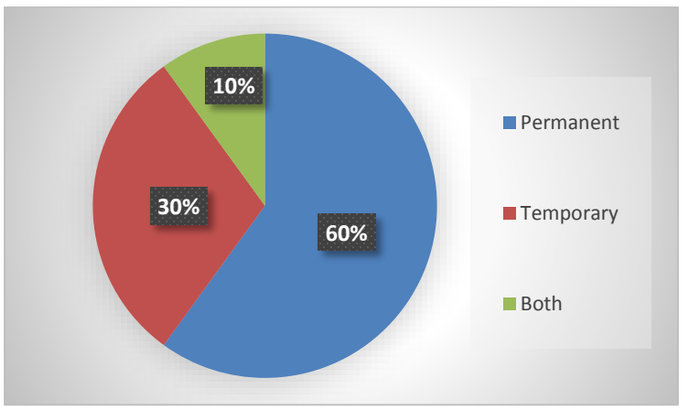

Figure 3.0: Types of event structures available.
Source: Authors' fieldwork (2017)

Assessment of Design features for flexibility

As observed from table 4.0, 100% of population studied had adaptability as their flexible design approach and this is as a result of the use of large open spaces. However, mobility was seen in 40% of the population, and this was seen where temporary structures were used for the event centres since they can always be disassembled and assembled at another location. The result also showed that none of the sample population had transformability as a flexible design approach. There was no change in their shape, space and appearance, there basic design features such as roofs, floors and walls were not flexible.

Table 4.0: Type of design approach adopted

S/No.	Name of Event centre	Flexible design approach		
		Adaptability	Mobility	Transformability
1	Abdulsalam Youth Centre	✓	*	*
2	COE Multipurpose Square	✓	*	*
3	Nasfah Hotel	✓	*	*
4	Uk Bello Art & Culture	✓	*	*
5	Vagosh Event Centre	✓	✓	*
6	Legbo Kutigi Conf. Centre	✓	*	*
7	Gidan Matasa	✓	✓	*
8	St. Michael Catholic Hall	✓	*	*
9	Posh Event Centre	✓	✓	*
10	Athena Event Arena	✓	✓	*
	TOTAL AVAILABLE	**10**	**4**	**0**
	PERCENTAGE	**100%**	**40%**	**0%**

Source: Authors' fieldwork, 2017

From table 5.0 it was observed that only 20% of the population had flexible design elements available, the other 80% had no design features for flexibility as represented in fig 4.0.

Table 5.0: Flexible design elements available

S/No.	Name of Event centre	Flexible design element	
		Available	Unavailable
1	Abdulsalam Youth Centre	*	✓
2	COE Multipurpose Square	*	✓
3	Nasfah Hotel	*	✓
4	Uk Bello Art & Culture	✓	*
5	Vagosh Event Centre	*	✓
6	Legbo Kutigi Conf. Centre	✓	*
7	Gidan Matasa	*	✓
8	St. Michael Catholic Hall	*	✓
9	Posh Event Centre	*	✓
10	Athena Event Arena	*	✓
	TOTAL AVAILABLE	**2**	**8**
	PERCENTAGE	**20%**	**80%**

Source: Authors' fieldwork, 2017

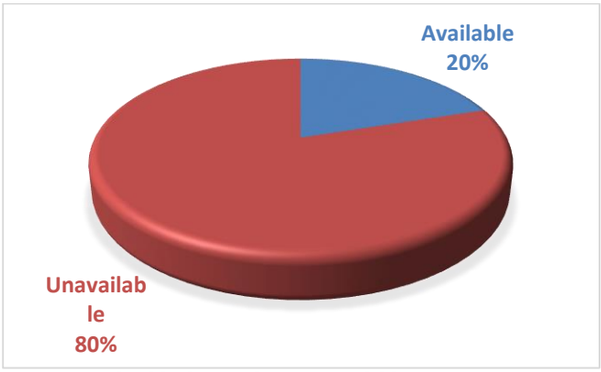

Figure 4.0: Flexible design elements available.
Source: Authors' fieldwork (2017)

From the 20% of the sample population, 10% moveable walls and the other 10% retractable roofs as observed in table 6.0 and represented in chart figure 5.0.

Table 6.0: Flexible design elements used

S/No.	Name of Event centre	Types available		
		Moveable Walls	Retractable roofs	Adjustable floors
1	Abdulsalam Youth Centre	*	*	*
2	COE Multipurpose Square	*	*	*
3	Nasfah Hotel	*	*	*
4	Uk Bello Art & Culture	✓	*	*
5	Vagosh Event Centre	*	*	*
6	Legbo Kutigi Conf. Centre	*	✓	*
7	Gidan Matasa	*	*	*
8	St. Michael Catholic Hall	*	*	*
9	Posh Event Centre	*	*	*
10	Athena Event Arena	*	*	*
	TOTAL AVAILABLE	**1**	**1**	**0**
	PERCENTAGE	**10%**	**10%**	**0%**

Source: Authors' fieldwork, 2017

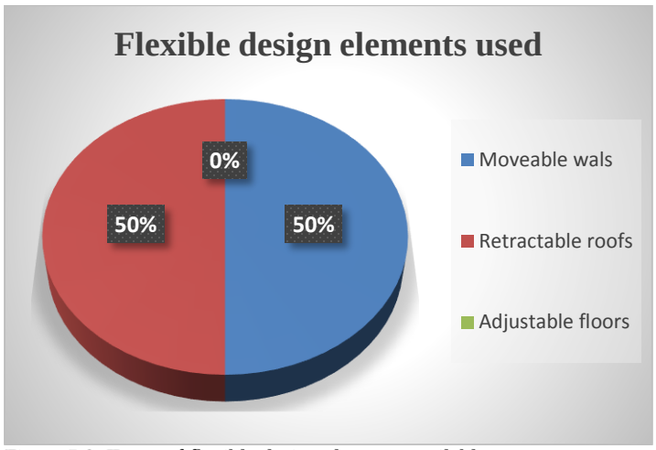

Figure 5.0: Types of flexible design elements available.
Source: Authors' fieldwork (2017)

Figure 5.0 and table 6.0 shows that moveable walls were available in one of the centres studied, although this was achieved using curtain to partition or divide spaces. Plate viii helps visualise the material used for partition, this shows that although the space division was achieved, it did not solve the problem of disturbance to that space.

Plate VIII; Curtains used as partition of space at UK Bello Art Theatre
Source: Authors' fieldwork (2017)

In the same vein, cotton fabric was used to reduce the total headroom of the event centre, serving as a false roof at one of the event centre studied which was 10% of the sample population. This was a retractable roof system adopted, but not only that the wrong material was used, it also created a non-functional space at the gallery as seen in plate ix.

Plate IX; Cotton fabric used as retractable roof to reduce headroom at Legbo Kutigi Hall.
Source: Authors' fieldwork (2017)

CONCLUSION

The study has clearly shown that event centres are facilities that attract different categories of persons together, and should be flexible enough to accommodate the needs of different users. In Minna, the study shows that the event centres do not have flexible design features that create or modify a space for change requirement. 60% which is over half of the sample population of event centres studied had just a single hall for events without providing flexible design features such as moveable walls, retractable roofs or seating in order to make the single hall flexible. Although it was observed that all events centres studied had the open space design which is adaptability, 80% of event centres in Minna failed to have flexible design features. The 20% that provided few of these features used materials that partially achieved this purpose making spaces non-functional.

RECOMMENDATION

In the design of event centres, designers need to recognise the fact that event spaces are multipurpose spaces, therefore it is important to use design features for flexibility such as

moveable walls, retractable roofs and sitting should be used in event centre designs to achieve an effective flexible design. Event centres attract an unpredictable population so space flexibility should be considered at all times and adopting all the flexible design approach so that as the users' needs change, the building also changes to meet their needs.

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ASSESSMENT OF PASSIVE SECURITY MEASURES IN HOTEL DESIGN IN OSUN STATE, NIGERIA

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Security challenges have become a very important factor to be considered in hotel buildings. This is because hotels being a part of the hospitality industry are more vulnerable to attacks either on the patrons or the staffs of the hotel due to high degree of accessibility. Security is an important aspect of managing and operating a successful hotel, and part of developing an effective hotel building includes helping ensure that the design features support a safe, conducive, and secure environment for customers, staffs, luggage and vehicles. The aim of this study is to assess passive security measures in hotel design as a means of reducing security risks in hotel building in Osun State. To conduct the research, nine (9) hotels was purposefully selected and data for the study was obtained using observation schedule purposefully structured to provide sufficient and relevant information for the analysis of the study. The data from the observation schedule was collated, entered into Microsoft excel for analysis purposes while results are presented in tables and charts, also pictures were also presented in plates to further buttress explanations within the result discussions. The study shows that passive security is a means that can be adopted to minimize security challenges in hotel buildings. The paper concludes by professing passive security design solution to security challenges in hotel buildings.

Keywords: Hospitality, hotel, passive security, security measures, security risk.

INTRODUCTION

A hotel is an establishment that provides paid lodging on a short-term basis with facilities provided ranging from a modest-quality mattress in a small room to large suites with bigger, higher-quality beds, a dresser, a fridge and other kitchen facilities, upholstered chairs, a flat screen television and en-suite bathrooms. Security and safety are important factors to be considered by an individual or group when choosing a destination and when selecting a hotel to stay at (Ghazi, 2015). According to Abraham Maslow category of human's needs, safety and security is the second human need after biological needs, therefore it is essential to feel comfort and tranquility (Aynifar, 2002). According to Maslow, when biological needs are satisfied, human-being pays attention to safety and security immediately. Increase in the number of travelers in 1950(s) and 1960(s) led to the creation of more hotels, and this hotels hired security forces to protect the fortune of the travelers and later focused on protecting the traveler's money, catching cheaters, and keeping the undesirables out (Darrell 2012). Security has to do with freedom from danger, anxiety and fear (Adedayo *et al*. 2017). According to Ibrahim *et al*, building security is the extent to which a building, its facilities and users are defended from a possible threat that can result into any form of damage to the building and its users. Building security extends beyond placement oh technology electronic systems in the building to detect trespassers but it is to be considered the designer at the concept stage to hinder or delay attacks. In order to be safe from social abnormalities and psychological insecurity, passive security can be considered to cause users tranquility by security of life and property.

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Passive security is a set of actions that needs no war tools and by using them, we can prevent life and property losses (Zarepoor *et al* , 2011). Belland 2015 defined insecurity to be a state of fear or anxiety due to absence or lack of protection. Achumba *et al,* 2013 stated that insecurity is has two perspectives which the state of a subject or item being subject to threat or danger, which could result into risk to the inhabitants or users of the building while it also considered insecurity as a psychological state of being vulnerable to risk and anticipation of misfortune. Security challenge have become a very important factor to be considered in hotel buildings. This is because hotels being a part of the hospitality industry are more vulnerable to attacks either on the patrons or the staffs of the hotel due to high degree of accessibility. Security is an important aspect of managing and operating a successful hotel, and part of developing an effective hotel building includes helping ensure that the design features support a safe, conducive, and secure environment for customers, staffs, luggage and vehicles. This project is geared towards assessing of passive security measures in hotel design, thereby providing a safe and secure environment for the users of the hotel, both staffs and lodgers.

Types of Hotels

There are sharp distinctions between hotels and it goes further by describing emerging hotel patterns (Chase, 2001). Some are new concepts and some build on the traditional types. Type has three traditional subdivisions of its own. They are:

- Commercial hotels
- Resort hotels, and
- Residential hotels.

Vulnerability of Hotel

It is been consider that reasons for targeting hotels are that they offer a high degree of access, usually 24 hours a day (Jaswinder, 2015). Larger hotels have many public spaces and entrances and exits and foreigners may gather there (Horner & Swarbrooke, 2004). Security is unlikely to have been a guiding principle in the architecture of most hotels and certain features such as grand lobbies and spacious entrances are vulnerable to individual suicide and car bombings. Research into hotel security has been limited to date, but work completed suggests that hotels commonly strive to create an environment which is both welcoming and secure against assorted manifestations of criminality (Gill *et al,* 2002). This is not an easy task as security may upset customers if it is deemed to be over-intrusive and an intrusion of privacy therefore, it should be discreetly, although an obvious presence can be a deterrent.

Passive Security

Passive security is a part of physical security that deals with the incorporation of architecture and landscaping in building and site design. Passive security design includes the use of passive security measures to prevent unauthorized access to personnel, equipment, installations, information, and to safeguard them against terrorism, damage and criminal activity (Physical security program, 2007). Passive security design helps to maintain a balance between the implementation of security design, with the probability of an occurrence of attack in a listed approach that may result in the acceptance of a conscious and acceptable level of risk (NIBS, 2014). The security of sites and buildings should be treated differently, as buildings and sites requires different level of protection. Site planning and site elements can be adjusted in the early stages of the design therefore eliminating costs that may rise from adjustments or changes that may arise in the latter part of the design (Nadel *et al,* 2001). In order to determine the level of risk in a building or a site, various things needs to be considered as each building and site has its own unique feature that need to be evaluated in order to develop a design that meets the required security level. Below are the various things to be considered.

i. The value of the asset.

ii. Identification of possible threats.

iii. Assessment of building or site's vulnerability to identified threats.

The result of the assessment provides a basis for the implementation of a security design that achieves the desired level of protection.

Passive Security Measures

Passive security measures are measures that involve the effective use of architecture, landscaping, and lighting to achieve improved security by deterring, disrupting, or mitigating potential threats (Smith, 2012). Passive security measures include:

i. Providing stand-off distance or setbacks to create protected building perimeter and to limit access into the building as represented in figure 1.

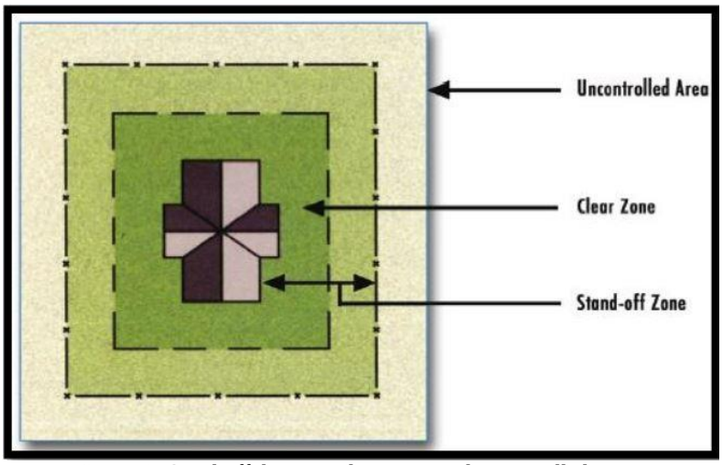

Figure 1. Stand-off distance, clear zone, and uncontrolled area.
Source: National Counterterrorism Centre, (2012).

ii. Provide effective building layout. (Effective design of building layout and orientation to a large extent will reduce opportunity of intrusion).

iii. Installation of barriers which include: Bollards, Reinforced planters, and site Furnishing to withstand assaults by moving vehicle as shown in plate1.

Plate 1 :The use of Landscape design as a defense mechanism.
Source: Centre for the Protection of National Infrastructure, (2011).

iv. Situating parking areas in secluded areas and eliminating under-building park areas to minimize blast effects from potential vehicle bomb which could lead to damage (Paradise, 2012)

v. The application of landscape design

Elements of Passive Security

Passive security elements includes the following:

a) Low screen walls

Low screen walls are walls with foundations of minimum 900mm and can have openings not greater than 1,200mm clear. Plate 2 below shows an example of a low screen wall.

Plate 2: Low screen walls as access control
Source: Singapore Building and Construction Authority,(2005)

b) Bollards

Bollards are passive security barriers with foundation depth of 300mm with maximum spacing of 1200mm (F.E.M.A, 2005). Bollards has its foundations tied together and it is can be used when perimeter security is of great importance. Shown in Plate 3 is a square bollard used as access control.

Plate 3: Passive bollards used for defining perimeter.
Source: Centre for the Protection of National Infrastructure, (2011).

c) Reinforced planters.

Reinforced planter with foundations 300mm below grade and planters of 900mm high above grade is required for protection (F.E.M.A, 2005). This is represented in Plate 4 below

Plate 4: Reinforced planters with foundation
Source: Source: Centre for the Protection of National Infrastructure, (2011).

d) Water Bodies

Water bodies serves as a passive security element when they are being properly channeled around the site or the building. This element helps to control access into the property by providing a defined entrance as shown in Plate 5.

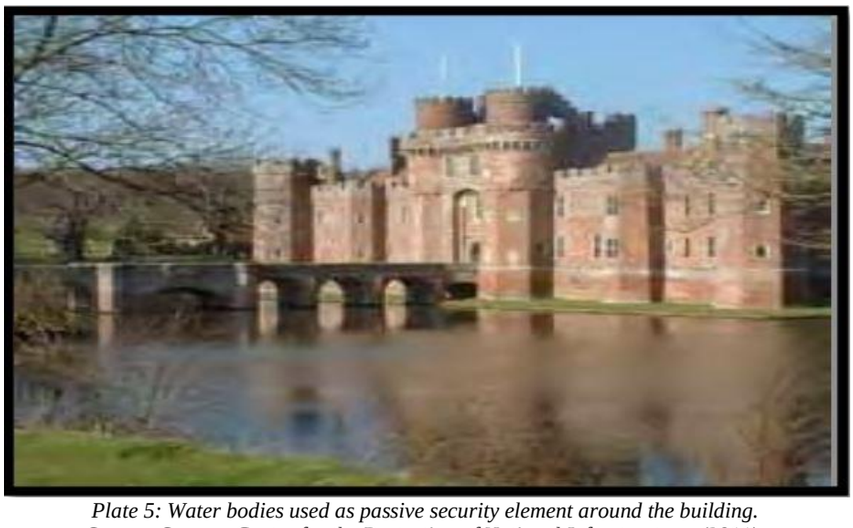

Plate 5: Water bodies used as passive security element around the building.
Source: Source: Centre for the Protection of National Infrastructure, (2011).

RESEARCH METHOD

Data for the study was obtained using a self administered observation schedule purposefully structured to provide sufficient and relevant information for the analysis of the study. The paper is majorly aimed at providing information on passive security elements in hotels and as well as a means to lessen the state of security challenges in hotels within Osun State. The State has 30 local government and this gives 3 senatorial zones. However, the concentration of urban centres is more with the east and west senatorial zones and three local governments each were selected from these zones. A local government that has the major urban centre was selected from the south senatorial zone, Osogbo (a local government in the state capital). The elements that were observed include:

- Basic security measures available at the hotel,
- Access control measures employed for pedestrian and vehicular access,
- Site features that defines boundary of spaces,
- Nature of windows and doors,
- Number of major access points into the hotel. (entrance/exit), and
- Standoff distances from the building.

The data from the observation schedule was collated, entered into Microsoft excel for analysis purposes while results are presented in tables and charts; pictures were also presented in plates to further buttress explanations within the result discussions.

Table 2: List of Studied Hotels in Osun State.

S/No	Name of Hotel	Location	Local Government
1.	Praise Banquet hotel	Ipetu-Ile.	Boripe
2.	Ideal Nest Hotel	Osogbo.	Osogbo
3.	Aenon Hotel and Suite	Osogbo.	Osogbo
4.	Miccom Golf Hotel and Resort	Ada.	Boripe
5.	Palmcrest Hotel and Suite	Osogbo	Osogbo
6.	Western Sun International Hotel	Ede.	Ede-North
7.	Galaxy Continental Hotel and Suite	Osogbo	Osogbo
8.	G.M.T. Hotel and Event Centre	Osogbo.	Osogbo
9.	Kings Event Centre and Suites	Ilesa.	Ilesa-West

Source: Author's fieldwork, 2017.

FINDINGS AND DISCUSSION OF RESULTS

The analysis of the data obtained through observation schedule was done and presented in tables and plates below. The passive security measures adopted in the studied hotels were analyzed and the result was presented in tables and charts. Table 2 shows the hotels assessed and the basic security measures they adopted, and figure 2 shows that 44% of the hotels made use of both the passive and active security measures while 45% adopted only the active

measure. Among the passive security elements that was employed includes short walls, shrubs and perimeter fencing as shown in plate 6.

Table 2: Basic security measures available at the Hotels.

S/n	Names	Passive	Active	Both	None
1.	Praise Banquet hotel		✓		
2.	Ideal Nest Hotel			✓	
3.	Aenon Hotel and Suite	✓	.		
4.	Miccom Golf Hotel			✓	
5.	Palmcrest Hotel		✓		
6.	Western Sun International Hotel			✓	
7.	Galaxy Continental Hotel and Suite		✓		
8.	G.M.T. Hotel and Event Centre		✓		
9.	Kings Event Centre and Suites			✓	
	Total:	1	4	4	

Source: Author's Fieldwork, 2017.

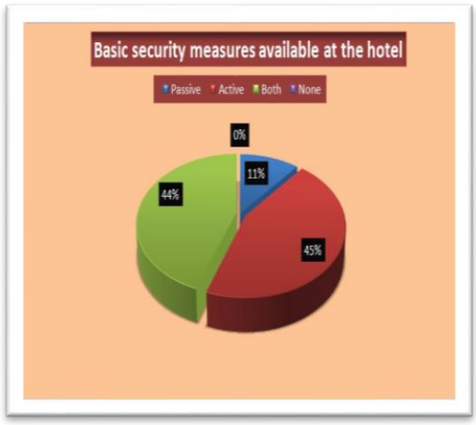

Figure 2. Basic security measures available at. the hotel

Plate 6. Active security measure employed at .Ideal Nest Hotel in Oshogbo

Table 3 shows the access control measures employed for pedestrian and vehicle access into and within the hotel. Figure 3 shows that 50% of the hotels employed the use of passive access control barriers and 50% used the active means thereby placing them on a balanced scale. Plate 8 shows a hotel using shrubs and kerbs as a passive access control means of controlling pedestrian and vehicular access into the hotel.

Table 3: Access control measures employed for pedestrian and vehicle access.

S/n	Names	Passive	Active	None
1.	Praise Banquet hotel		✓	
2.	Ideal Nest Hotel	✓		
3.	Aenon Hotel and Suite		. ✓	
4.	Miccom Golf Hotel	✓	✓	
5.	Palmcrest Hotel	✓		
6.	Western Sun International Hotel	✓	✓	
7.	Galaxy Continental Hotel and Suite		✓	
8.	G.M.T. Hotel and Event Centre		✓	
9.	Kings Event Centre and Suites		✓	
	Total:	**4**	**7**	**0**

Source: Author's fieldwork.

Figure 3. Access control measures available at the hotel.

Plate 6. Shrubs and kerbs employed as vehicular control measure employed at Miccom Golf Hotel, Ada.

Standoff distance is the distance or allowance between an asset and a threat. It is determined by the type of threat, the type of construction, and desired level of protection. Maximizing standoff distance creates chances to upgrade hotel buildings to meet increased threats or to accommodate higher levels of protection. The primary design strategy is to keep terrorists or any form of threats far from the inhabited building (Russ, 2013). Table 4 shows the stand-off distance in the hotels and figure 4 shows that 56% of the hotels has a stand-off distance of 15m and above. Plate 7 shows one of the hotel with the stand-off distance as a means of zoning away potential harm away from the building.

Table 3: Stand-off Distance from the Hotel building.

S/n	Names	5m & Below	6m - 10m	11m - 15m	15m and above
1.	Praise Banquet hotel				✓
2.	Ideal Nest Hotel				✓
3.	Aenon Hotel and Suite		. ✓		
4.	Miccom Golf Hotel				✓
5.	Palmcrest Hotel				✓
6.	Western Sun International Hotel			✓	
7.	Galaxy Continental Hotel and Suite		✓		
S/n	Names	5m & Below	6m - 10m	11m - 15m	15m and above
8.	G.M.T. Hotel and Event Centre			✓	
9.	Kings Event Centre and Suites				✓
	Total:	**0**	**2**	**2**	**5**

Source: Author's fieldwork.

Figure 3. Stand-off distance observed by the hotels

Plate 6. Stand-off Distance observed by Miccom Golf Hotel, Ada.

CONCLUSION

The support of a safe, conducive, and secure environment for customers, staff, luggage and vehicles for passive security measures in hotel design is very necessary and important in hotel buildings. The provision of standoff distance or setbacks to protect the building perimeter by limiting access into the hotel was found to be at 15m and above for 56% of the hotels, which implied that majority of the hotels had a means of zoning away likely mischief. The introduction of Installed barriers like Bollards, Reinforced planters, and site Furnishing were observed in 50% of the hotels while the other 50% used the active means to aid in the control of moving vehicles. Therefore, the use of passive approach in the practice and application of security involves the use of passive approach, which when fully applied can be effective in securing a hotel building.

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ASSESSMENT OF THE LEVEL OF INTEGRATION OF ORGANIC ARCHITECTURE IN HOTEL BUILDINGS IN MAKURDI, BENUE STATE

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There had been a tremendous boom in the construction industry since the last 20th century and a corresponding depletion of the natural features of the environment. This had led to the development of various philosophies and sustainable design concepts aimed at preserving nature and curbing the adverse effect of building construction on the environment. One of these concepts is organic architecture. Organic architecture has become a significant concept implored in the design of buildings as part of an eco-friendly and sustainable built environment. It involves integrating buildings into their host environment to create harmony between buildings and natural elements in their surroundings. The aim of this research is to examine the level to which Organic Architecture has been integrated in the design of hotel buildings in Makurdi, Benue State. For the purpose of this research, data were collected from some selected hotels in Makurdi, – the study area. Direct interviews and structured observation schedules were the research instruments used for gathering data which were analyzed using descriptive statistical tools. The data showed that the level of awareness among professionals and hotel developers on the concept of Organic Architecture was above average but the application of the concept in hotel buildings was low. The paper concludes that organic architecture design concept which conserves natural resources and encourages the use of natural non-toxic materials in building construction has not been sufficiently employed in the design and construction of hotel buildings and recommends that people should be encouraged to embrace the concept of Organic Architecture to take advantage of its numerous environmental and health benefits.

Keywords: Eco friendly, Health benefits, Natural elements, Organic architecture, Sustainable environment.

INTRODUCTION

Recent studies and reports from United Nations has pointed out that the climate is changing and human activities on the environments play a major role in causing this changes through reckless management of resources and pollution (Bernstein and Peter, 2007). The construction Industry contributes immensely to environmental degradation and depletion of natural resources. Most of the existing buildings have negative impacts on the environment. Adequate measures have not been taken to ensure that the new buildings being constructed do not produce similar impacts. (Edoka *et al.,* 2009). The need to address these issues in order to conserve natural resources and create a sustainable environment has become eminent. The use of sustainable and environmentally friendly ideologies and construction materials is been encouraged globally to curb the negative impact of building construction in the environment (Nwoke and Ugwuishiwu, 2015).

Organic architecture is one of the architectural design concepts aimed at reducing the adverse impact the construction industry pose to the environment. According to Pearson (2001) sustainable development in architecture is the atmosphere or prevailing idea of a building or place that emphasizes the connection between people and the environment. It encourages people to see this connection to nature and embrace the interaction and enjoyment it provides. Organic Architecture is a design philosophy that tends to create harmony between buildings and the natural elements in their surroundings.

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Buildings are constructed to flow with the existing features of the site. Natural features such as mountains, water bodies, trees and shrubs are preserved and integrated into the building designs (Filiz, 2006). The essence of organic architecture is to preserve the natural elements around a building by incorporating them into the designs so that the building and the site will act as a single entity rather than forming a contrast (Rattenbury, 2000). A kind of symbiotic relationship is established between the building and its site where the building enhances the environment and is also enhanced by the environment (Whiting, 2007).

The aim of this research is to examine the level to which Organic Architecture has been integrated in the design of hotel buildings in Makurdi, Benue State. The extent to which the concept of Organic Architecture has been utilized in hotels in Makurdi will be analyzed and the degree of awareness of the concept among hotel developers in Makurdi will also be determined.

The Concept of Organic Architecture

Organic is widely used to represent substances that have plant and animal characteristics (living organisms) but it takes a new meaning in architecture. It is philosophical movement which promotes the union of buildings and the natural elements in their sites (Mirzael, 2016). Organic architecture was initiated by frank Lloyd wright in the 19th century. The word organic was publicly pronounced for the first time in a lecture by Claude Bragdon at the art institute in Chicago in 1915. But it was declared as a philosophy in architecture for the first time at a gathering of British architects in 1939 by frank Lloyd wright (Andrew, 2017). He proclaimed that organic architecture belonged to an organic society that rejects exterior aesthetics, taste and embraces Art, Science and Religion as one entity (Heinz, 2010). The later growth and development of the philosophy can be attributed to Frank Lloyd Wright who is widely referred to as the founder of organic architecture. Frank Lloyd Wright was borne in 1867 in Wisconsin. He was heavily influenced by Louis Henry Sullivan who inspired him to discover a new architectural philosophy associated with contemporary life by examining natural rhythm and processes (Andrew, 2017). He believed that man and nature have the power of creation and should therefore work in harmony for the order of creation. His approach gained rapid reputation in the Midwest of the United States especially in Chicago Illinois. This growth was mainly due to the exploitation of the rich and abundant land that was America's most national asset (Meister and Richardson, 1999). Lloyd wright also used organic architecture in his many works. Robbie house in Illinois, Fallingwaters in Pennsylvania, and Taliesin west in Scottsdale. In his designs, he emphasized the concept by integrating natural surrounds such as water, terrain, plants and lighting into his designs. He encouraged open space designs and free flow among functions (Alex, 2008). Fallingwaters shown below is one of Lloyd Wright's projects where Organic Architecture was expressed explicitly (Pearson, 2011). The building was constructed directly over natural water and blends effortlessly with the dense vegetation and rocky terrain along the banks of the water.

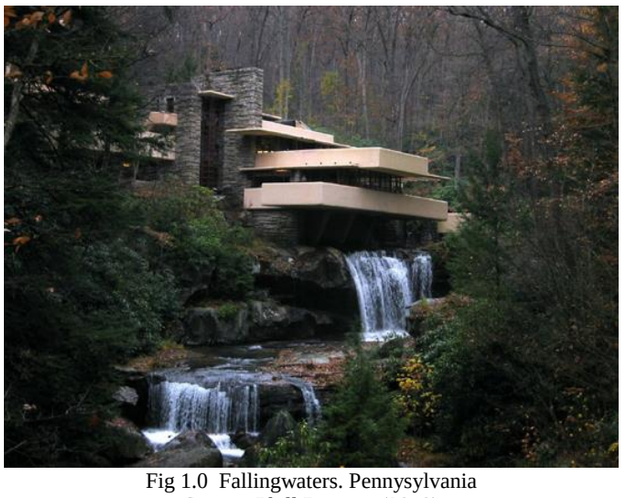

Fig 1.0 Fallingwaters. Pennysylvania
Source: Phill Romans (2010)

Lloyd wright's ideological and design concepts form the basis for organic architecture which ha been employed as a viable sustainable building design tool over the years. According to Andrew (2017), Building is like a natural element. It is one complete component of environment which has grown elements that have harmony with natural features. Alexander and Christopher, (2002) Lloyd wright envisions a city and regional planning of the future centered on creating closeness to nature by conserving natural resources.

Building and Site

Organic architecture seeks to create a kind of symbiotic relationship between a building and the natural elements of its site. The building is designed to fit into the components of the site such as vegetation, water bodies, mountains and other landforms in such a way that it appears to have grown naturally in the site. This harmony conserves the natural features of the environment and enhances biodiversity.

Materials

In organic designs, the use of natural materials such as wood, straw, stones, and mud is encouraged. They create a blend in terms of colour, texture, and forms with their surrounding (Alexander, 2002). Using them in their raw forms is also encouraged as it creates sense of closeness to nature. Ornamentations are usually developed as basic parts of the materials such as patterns cut out on woods and carving on stones. These natural materials are non toxic hence cause no harm to the environment.

Architectural Design Elements

These are sustainable man made design features used in organic architecture. They are designed to have flowing plans where functions are open to nature. They tend to unite the interior space with the exterior space so that the two functions as one. They bring users closer to nature. Examples include courtyards, balconies, terraces, gardens, gazebos, pergolas, swimming pools, and patios.

The Need for Integration of Organic Architecture in Hotel Buildings

Hotels are establishments that provide accommodation and services for people who are away from home for both long and short period of time (Baker et al, 2000). It is one of the places where people visit for the purpose of relaxation and to enjoy non synthetic and comfortable natural environment. Globally, there has been rapid growth and development of the industry in the last century. However, contemporary building materials such as steel and concrete which are considered hostile to the environment form the major materials used for their construction. According to Annunzo (2010), Cement and Steel production use large amount of energy and volumes of water. They emit considerable amount of co2 into the atmosphere. The steel industry also burn up fuel and electricity which have adverse impacts on the environment (Ellis *et al*., 2001). The result of these is a continuous degradation of the environment and exploitation of nature resources. Organic architecture however is directed towards the conservation of resources and promotion of biodiversity. It encourages a close union between buildings and natural features. This harmony provides clean and toxic free environments that provide the comfort required of hotels. Destruction or removal of existing features is discouraged. Rather, they should be enhanced. This increase the aesthetic values of the buildings and the environment.

Benefits of Organic Architecture

There are numerous environmental, economic and health advantages of organic architecture. Environmental benefits include conservation of natural resources and biodiversity. Biodiversity is an essential part of natural element which is undergoing rapid loss. Its conservation has become a very important area that must be considered. One of the ways this can be achieved through energy efficient and sustainable means of building construction (Mitchell *et al*., 2014). Economic benefits include energy efficiency. Energy efficiency is a primary goal in any sustainable built environment. Care must be taken both at the design and construction stages of buildings to ensure that natural energy is conserved and materials having low embodied energy values be used. Other economic benefits of Organic Architecture include reduced operation cost, and increased asset value. Health benefits include temperature regulation, greater indoor air quality and non-synthetic, non-toxic materials (English Heritage 2013).

METHODOLOGY

This paper employed the descriptive method of research. Structured observation schedule was used to evaluate the nature of the hotel surrounds and to determine the natural features of the surroundings that are integrated into the hotel buildings. The natural materials used in constructing the buildings and the organic architecture design elements used were also derived from the schedule. Randomly selected building professionals and the developers of

the hotels were interviewed to determine the level of awareness of the concept of organic architecture and the frequency of its application in hotel building designs. The data collated was analyzed using SPSS and the results were presented in charts.

Makurdi which is the capital city of Benue State is chosen as the study area for this research because it has a variety of natural features such as highly vegetated landscapes, mountains, plains, and water bodies all of which can be integrated into buildings to achieve organic architecture. 13 hotels were selected for the purpose of this design through stratified random sampling method. 60 professionals in the building industry and hotel developers were interviewed. The key information derived from the interviews include the level of knowledge of organic architecture and the frequency of use of the concept.

Table 1.0: Hotels studied

S/N	Name of hotel	Location	No.of Rooms
1	Benue Hotel & Resorts	Along Ahmedu Bello Way. Old GRA, Makurdi.	300
2	Doo palace Hotel	Father Hunter St. Nyiman, Makurdi.	62
3	Benue Sheraton Hotel	Opp Government House. Old GRA, Makurdi.	420
4	Hotel Reuphina	Emmanuel Mande Close. Old GRA, Makurdi.	20
5	De Manor Hotel	Hudco Quarters. North Bank, Makurdi.	16
6	Zagnas Hotel	Jumbo Lane Hudco Quarters. High Level. Makurdi.	205
7	Benue Metropolitan Hotel	Atiku Abubakar Way. Old GRA, Makurdi.	160
8	J. S. Tarka Hotel	Opp. IBB square. High Level, Makurdi.	205
9	Chekinbou Hotel	Balewa Crescent. High Level, Makurdi.	12
10	Smileview Hotel	Father Hunter St. Nyiman, Makurdi.	53
11	Dony Suites	Orti Bende St. Old GRA, Makurdi.	28
12	Gordon Plaza Hotel	Lushakwa Anija st. Old GRA, Makurdi.	120
13	Bem Hotel	7th Avenue Ankpa Quarters, High Level Makurdi.	26

Source: Authors' fieldwork, 2017

RESULTS AND DISCUSSIONS

The results derived from the survey shows that awareness or knowledge of organic architecture among professionals in the building industry is not lacking but the level of application of the concept in hotel buildings is low. It also shows that considerable number of the hotels used natural materials for auxiliary structures but not of them did not integrate natural environmental features into the hotels.

Knowledge and Frequency of use of Organic Architecture

Majority of the professionals and developers interviewed possess above average knowledge of the concept of organic architecture as shown in the figure below. 42% of them have good knowledge while 18% have excellent knowledge. Only 7% have poor knowledge of the concept. But, the degree to which they apply the concept of organic architecture in their buildings is low.58% and 34% of them fall within the rare and very rare categories respectively. They pointed out that having to satisfy the desires of their clients who always want the use of the more common contemporary ideologies and materials as the major reason behind the low level of application of the concept. Some of them also complained that the hotels are usually situated away from natural features such as rocks, water bodies and vegetation that can be integrated into the buildings to achieve organic architecture.

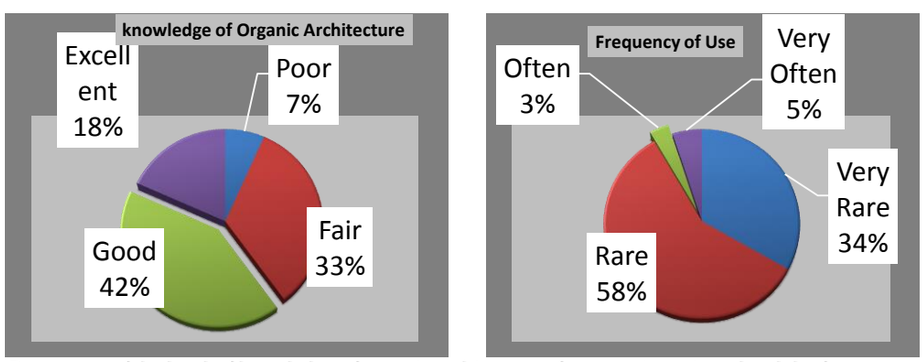

Fig 2.0: Percentage of the level of knowledge of organic architecture of persons interviewed and the frequency at which they apply the concept of organic architecture.
Source: Authors' fieldwork, 2017

Integrated Natural Features

Majority of the hotel buildings are located within the city centre and far from natural environmental features. 63% of the hotels do not have any of these features around them. However, a few of them are located within range from river Benue and rocks along its banks as shown in Fig 3.0. The river provides only scenery but the rocks are integrated into the landscape design within the hotels. Dense natural vegetative cover is present in only 13% of the hotels. The fact that most of the hotels are situated away from these natural features means that the buildings cannot be integrated into them to create the harmony between building and site that is required of organic architecture. In the few locations where some of these features are present, they are usually destroyed to give way for the buildings. Some of the developers agreed to have cut down some trees and graded uneven terrains in the course of construction.

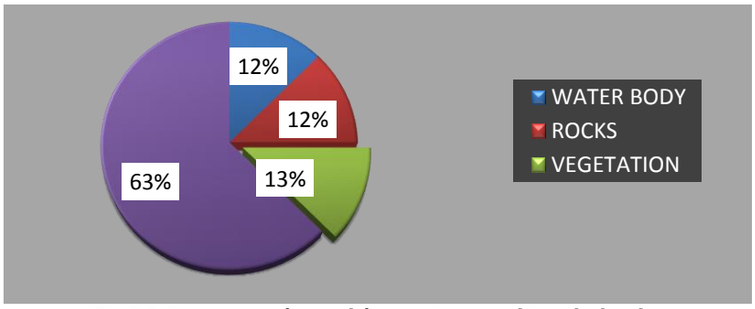

Fig 3.0: Percentage of natural features integrated into the hotels.
Source: Authors' fieldwork, 2017

Natural Materials and Finishes

39% the hotels considered did not make use of natural construction materials. However, a good number of them employed the use of wood and straw in constructing auxiliary facilities in the hotels. The materials were used in their natural forms. Fig 4.0 shows the degree to which these materials were used in the hotels. The degree to which wood was used equals that of straw (23%). Only 15% used stones. This implies that some attempts were made to synthesis the buildings with their surrounding using natural construction materials but they were applied only to auxiliary structures. The main hotel buildings are constructed using contemporary building materials such as concrete and steel.

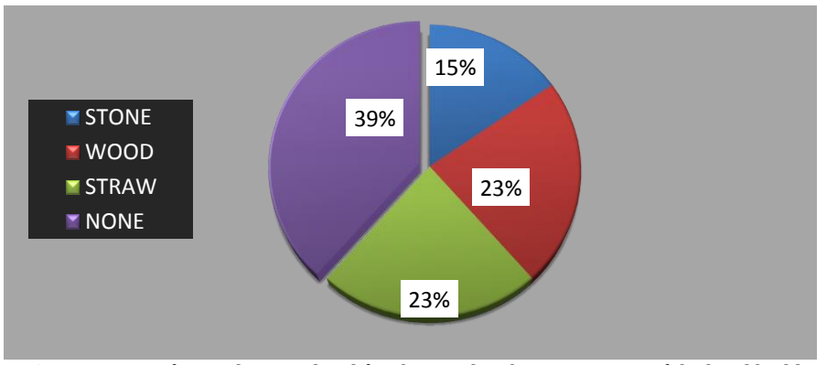

Fig 2.0: Percentage of natural material and finishes used in the construction of the hotel buildings
Source: Authors' fieldwork, 2017

Architectural Design Features

These are construction elements made mostly of natural construction materials and constructed in a way that harmonizes them with the natural features of the environment. Elements such as Courtyards, Balconies, Terraces, Swimming pools, Green roofs, Gazebos, and Pergolas tend to connect the interior spaces with the exterior such that the two functions as one. While swimming pools and gardens create a greater sense of closeness to nature. Fig 5.0 shows that swimming pools dominates the design features used in the hotels. Only 10%of the hotels did not make use of any of the design features. 14% used courtyards, gardens, cantilever balconies, and gazebos. Design features such as pergolas, green roofs, and terraces were not used at all.

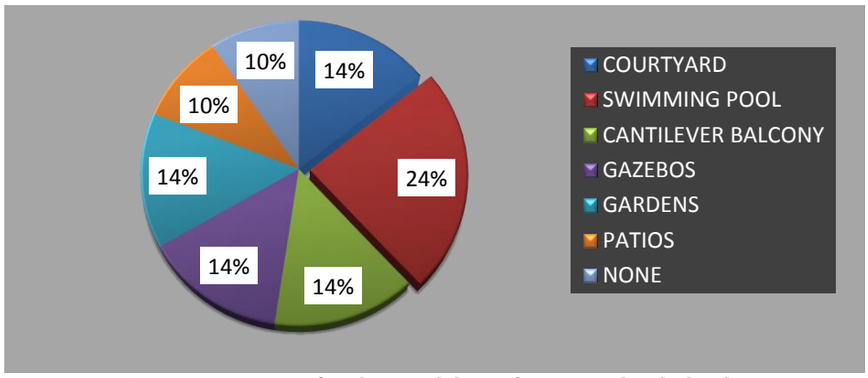

Fig 3.0: Percentage of Architectural design features used in the hotels
Source: Authors' fieldwork, 2017

CONCLUSION AND RECOMMENDATIONS

The negative impact of the construction industry on the environment has necessitated the need to employ more sustainable ways in constructing buildings. This is also true of hotel building constructed in Makurdi, Benue State. Organic architecture promotes sustainable building by integrating the building into their surroundings. This concept of building design and construction conserves the natural elements of the environment and brings nature closer to the users of the buildings. In Makurdi, Benue State, this design ideology of integrating hotel buildings into the environment has not been sufficiently adopted in the design of hotel buildings.

During the course of the research, many of the professionals and hotel developers interviewed claim to have sufficient knowledge of organic architecture but the level of application is relatively very low. Considerable attempt was made to achieve this union between building and site using natural building materials and design elements but these materials were only used on auxiliary facilities and not on the main hotel buildings. Professionals in the building industry should adopt the concept of organic architecture in their designs and construction. It is a reliable step towards a more sustainable and environmental friendly design philosophy.

The general public should be encouraged to embrace the concept of organic architecture to take advantage of its numerous environmental and health benefits.

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INTEGRATING CULTURAL IDENTITY TO BROADCASTING STATION DESIGN IN NORTH CENTRAL NIGERIA: PERCEPTION OF BROADCAST STATION WORKERS

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The Nigerian society has undergone rapid modern development that it has resulted partly in loss of the nation's character and identity and its architecture. The modern trend gradually corrodes the fabric of the Nigerian cultural identity and the sense of oneness from continual demand for foreign and western culture and lifestyle promoted through broadcasting. Culture though not static with its ever changing dynamism can be achieved while upholding the very essence of the national and cultural existence. In Nigeria, television stations were established to promote the arts, culture and traditional architecture of Nigerian society. Yet little is known through their design about their impact in reflecting the purpose of establishment across the nation. The paper explores a new paradigm shift and an approach to broadcasting station design by integrating cultural concepts into its buildings. The objective is to identify Nigeria's cultural and physical characteristics that can be integrated into the architecture of broadcasting stations with a focus on North Central, Nigeria. The methodological approach of the research is predicated on extensive literature review, qualitatively examining sustainable materials for their construction, physical observation of selected Nigeria Television Stations (NTS) design and interviews with NTS workers to get their perception on cultural integration in design of broadcast station . One of the suggestions drawn from this study is the need for a paradigm shift in the current approach to designing broadcasting stations in Nigeria. It concludes that greater priority needs to be devoted to cultural concepts in the architectural design approach to these buildings to reconcile their incompatibility to their immediate environment in which they are located.

Keywords: Broadcasting stations, Cultural concepts, Cultural identity, Sustainability

INTRODUCTION

Today the international broadcasting community is on the verge of a revolution in television content creation and transmission, brought about by a range of stunning digital technologies (Bird, 2002; 2003). These technological advancement and globalization has had and will continue to have far reaching consequences on the television industry in Nigeria and invariably its people's lifestyle, culture and consequently the future of Nigeria. As the world gradually becomes a global village some culture harmonize prevailing culture, others imbibed them while others are lost to other cultures promoted by the media. The television since its inception in 1890 and 1959 in Nigeria has become a powerful tool for promoting culture and national identity. This modernization has resulted partly in loss of the nation's character and identity and its architecture. The modern trend gradually corrodes the fabric of the Nigerian cultural identity and the sense of oneness from continual demand for foreign and western culture promoted broadcasting. In Nigeria, television broadcasting was first established on 31st of October 1959 in Ibadan, by then government of the Western Region Nigerian. The Nigerian Television Authority (N.T.A) provided a far more organized approach to television expansion and utilization in Nigeria because its functions were carefully mapped out by the decree (No. 24 of 1977).

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Bamidele & Akande, (2018). **INTEGRATING CULTURAL IDENTITY TO BROADCASTING STATION DESIGN IN NORTH CENTRAL NIGERIA: PERCEPTION OF BROADCAST STATION WORKERS.** Contemporary Issues and Sustainable Practices in the Built Environment. School of Environmental Technology Conference, SETIC, 2018

According to Acholonu (2016) the presence of television in the third world countries has been a Trojan horse, for promoting western culture. Many African counties have seen the need to preserve its culture, and so in broadcasting station**,** broadcast in local dialect and programs are more culturally inclined. Nigeria is not left behind in this attempt. (Ademola, 2013) National Television station (NTS), and many other broadcasting stations in Nigeria now broadcast programs wearing cultural attires and in local languages. This attempt may preserve the non-material culture but little is done to preserve the material culture in which architecture is a major part of. Architecture has for long been one of the key expressions of the culture and identity of a people.

Globally, culture exists within the society or societies in which man lives. In western society culture is refinement, opera classical music high art and fashion. Meanwhile, in African context, the term culture covers every single endeavor and aspect of the lives of the members of a given society. According to Clarence City Council Cultural History Plan, a(2009-2013), certain parts of the culture are inherited traditions, which forms the very essence of the existence of any society, is referred to as cultural inheritance. In North Central Nigeria there are over ten different culture and tradition, and this cultural diversity according to (Hargrave, 2007), covers the protection and preservation of national heritage and culture; the protection and preservation of local culture; ethnic and linguistic diversity; protection of physically challenged of the society and plurality of voice and opinion**.**

Broadcasting stations, as afore mentioned, are major instrument for preserving, maintaining, and promoting cultural diversity of the host community, and as such should be community based not only in telecast but its architectural design. Internationally, the design of broadcasting stations, have become means indicate cultural dominance, technological advancement and economic prowess of the host community. Broadcasting stations in its design should typically provide platform for community participation and social interaction. Provide a façade value that appreciates the culture and lifestyle of the community.

Sustainability and Culture

(Brundtland *et al*. 1987) defines sustainable development to mean development that meets the needs of the present without compromising the ability of future generations to meet their own needs. Sustainable development revolves around three principal issues which are: ecology; economy; and social/cultural aspects. Sustainability can be divided into three areas of focus namely:

1. Social sustainability: involves cultural promotion, access to resources, providing the need of the community, equal opportunity, readiness to resolve conflicts, knowledge management and empowerment of all, freedom, gender equality, healthy neighbourhood and overall human management
2. Economically sustainability: cost effectiveness in building
3. Environmental sustainability: protecting and preserving the environment for future generation. Environmental sustainability of material is measured against the following back drop.
    i. Life cycle analysis Biodegradable nature of materials
    ii. method of production, and effect of process on the ecosystem
    iii. Environmental impact of material during its life span

This research looks more into the cultural preservation which is a major part of social sustainability. (Littig *et al*. 2005) defines social sustainability is a quality of societies. It signifies the nature-society relationships, mediated by work, as well as relationships within the society. Social sustainability is given, if work within a society and the related institutional arrangements satisfy an extended set of human needs and are shaped in a way that nature and its reproductive capabilities are preserved over a long period of time and the normative claims of social justice, human dignity and participation. (Azelsson 2013) defines cultural sustainability as inter- and intra-generational access to cultural resources. Some of the indicators of social cultural sustainability in architecture are

i. Social interaction: Humans are social animals and the need for social interaction for man cannot be over emphasised, the design of physical spaces for interaction has become a major emphasis for Architects, in a facility design including prisons. The culture traditional architecture of the North Centralpeople of Nigeria

understand this need and so its design was majorly to allow for interaction between immediate family and even the external community.it provided open spaces as meeting areas for adults, children play area, which are all broadcasting medium have been incorporate over ages. (Kefayati *et al.* 2015), socialization feature of architecture space can reduce or increase the level of social interaction among in space, and therefore causes an increase in social capital.

ii. Architectural identity: Despite differences in land, which have affected its shape, architecture has inherently dynamic and progressive features that are called identity. Design of spaces with the identity rooted in the culture and history of the society is the unique architectural feature of each territory (Kefayati *et al*. 2015).

iii. Social security: One of the indicators of cultural social sustainability is to create a sense of security, the circular arrangement of the traditional setting of the North Central tribes is aimed at this. The need to provide the occupant with a sense of security even in an open space is a major factor for designers.

iv. Flexibility: Flexibility involves diversity adaptability and variability. Most of cultural spaces are multifunctional and sustainability is also the ability of spaces to available for change of use or multiple users.

v. Social participation: Participation in customary activities can increase a person's connection to the values and norms of society in this way that the customary values and norms are internalized during the activities. Involvement allows a person a sense of belonging to the society. Broadcasting station which allow for citizens' involvement gives an impression of the voice of the public.

Sustainable Cultural Centred Broadcasting Station Design

According to Worldwatch Institute (1995), building construction consumes 40 percent of the raw stone, gravel, and sand used globally each year, and 25 percent of the virgin wood. Buildings also account for 40 percent of the energy and 16 percent of the water used annually worldwide.

Sustainable design is not limited to simply trying to be more efficient. A new approach offers a clear alternative: an ecologically intelligent framework in which the safe, regenerative productivity of nature provides models for wholly positive human designs. Sustainable design emerged in the late 1980s as an extension and integration of the environmental and energy-efficiency movements. Environmentally conscious designers wanted to more fully integrate their approaches with a wide range of environmental issues, including energy efficiency, indoor air quality, and resource efficiency (Muscoe, 2000).

High-performance buildings, green design practices, and sustainable technologies are becoming increasingly important influences on architectural practices around the world. They are even beginning to influence standards within the construction industry. Encouraged by growing interest and demand on the part of the public and private sectors, multidisciplinary professionals - from architects to environmental managers, from engineers to landscape architects and beyond - are redefining the way we look at design and examining our environmental impacts on the earth with an integrated, holistic approach (Velazquez, 2005). The need to build a socially sustainable cultural-centred broadcasting station should require that station provided a community centred media house.

In the face of globalization and cultural complexities, there has been a threat of the extinction of indigenous cultures all over the world. (Gusha, 1989), In the wake of global modernization, the culture of Nigeria society has become transcultural (imbibing other cultures) which has seen to the gradual ebbing away of cultural origin and concerted efforts are been made at various levels to salvage this situation. The media which undoubtedly is one of the most powerful tools for promoting and maintaining the cultural identity of the people is not left out. But over years this cultural identity has been one sided, and has not found its way in the architectural design of national broadcasting stations which has become a symbols of both cultural and national identity of the people as a tool to promote it. The failure of this has seen to the gradually loss of the material culture and tradition in building design.

To halt the aforementioned trend, this paper explores a new paradigm shift and an approach to broadcasting station design by integrating cultural concepts into the architecture of its

buildings with a focus on the culture of the North Central people of Nigeria. The question this paper seeks to address is "*How can cultural identity of the North Central Nigeria be preserved through architectural approach to broadcasting station design*"? The paper aimed at integrating cultural identity and concept solving social design problems of broadcasting station in North Central Nigeria. Its objectives include:

i. To identify the cultural and physical characteristics of the architecture in the study area and the design problem in broadcasting station they can be used to solve.

ii. To determine indigenous sustainable building materials within the study area with a view to integrating in contemporary broadcasting station design.

iii. To determine the cultural social sustainable design features of the study area with view to incorporating in the design of broadcasting station

Local Sustainable Building Materials and Broadcasting Station Design Problems Solution

1. Earth 'adobe' and reverberation: one of the major problems of broadcasting studio is long reverberation and rammed earth which is readily available and environmental sustainable is an excellent sound absorption and reverberation quality. The monolithic mass of rammed earth is an excellent form of sound insulation. According Daza, (2016), measurements done by some researchers found that a rammed earth wall 300mm thickness achieve Sound Transmission Class STC 57dB5) and a rammed earth wall 250mm thickness achieve Sound Transmission Class STC 50dB6, good results for any material.
2. Earth, stone and internal thermal comfort: earth 'Adobe' absorbs heat during the day which allows the house to remain cool during the day in the temperate region where the weather is hot during the day, and then release this stored heat during the night period which is usually cold, allowing the interior of the house to remain warm at night. This characteristic is due to the high specific heat capacity of earth which is an important factor that allows this material to reduce the thermal gradient of earthen houses. This is an important property for broadcasting station which requires constant air conditioning for the machines and its workers. Fiber reinforced mud brick houses also have been found to be superior to concrete brick houses in reducing large fluctuations of indoor temperatures during the summer and winter (Martin *et al*., 2010;Binici *et al*., 2009).
3. Earth, stone and reduced energy consumption: one of the major factor for sustainability is to reduce energy consumption as it is able to cool during the day. Experience has shown that earth remains a viable material, given costly increases in energy consumption caused by the production of modern building materials (Agarwal, 1981)
4. Earth, stone and fireproof nature: experiments have proven earth and stone to be highly fire resistance.
5. Timber/ wood: Wood is a 100% natural and ecological material. It is recyclable and biodegradable and its life exceeds that of many other materials on the market. Its use helps limit greenhouse gas emissions because it absorbs CO2. Moreover, wood production requires little energy. Wood is a sustainable and resistant material when used under right condition.

METHODOLOGY

This study engaged a combination of methods. Qualitative data collection method, involving interviews and distribution of questionnaire targeted at stakeholders and indigenes of North Central of Nigeria. The case study broadcasting station comprises of, all the seven state capital NTA stations in the state capitals in the study area purposively selected . Selection were based on the fact that the state capital NTA have more air coverage area, and more staff strength. A review of literature, on the culture, and cultural features adaptable in design of broadcasting station. The sources of literatures include government policy document, journals and published books. The distributed questionnaire consists of, total of 10 questions, targeted at the randomly selected staffs of the national television stations (NTS). The questions were two-choice, five-choice types. The two-choice questions were to indicate

validity and the clarity. While scaled five –choice questions were to measure level of impart. A total of 25 copies of the questionnaire were distributed to staff of NTA stations visited.

Figure 1 shows the study location comprising (seven) 7 stations, as shown on the location map. The majority of the tribes are Hausa, Fulani, Nupe, Tiv, Eggon, Mada, Yoruba, and Gbagyi. spanning from the west of river Niger to river Benue. The prevailing weather are raining season and Harmattan season.

Figure 1: State in North Central Nigeria. Source: nigeriavillagesquare.com.

RESULT AND DISCUSSION

This study discusses culture in the light of social sustainability and some desirable features of culture and characteristics of traditional architecture in the study area. The research reveals that preservation of culture is a social necessity.

Table 1: Importance of cultural preservation in design of broadcasting station

Importance of cultural preservation in	Percentage of particular importance				
	Strongly Agree	Agree	Neutral	Disagree	Strongly Disagree
Building reflects cultural type of design	5	35	5	50	5
Building façade create visual/physical appeal to study area culture	5	15		40	20
Necessity of reflecting culture tradition and history	45	35	10	10	-
Building pays attends to beliefs/convictions of people	-	30	20	50	-
Building improves quality of life through communal relationship	-	9	19	72	-

According to Table 1, 70% of the respondent agree that culture can be incorporated in the design of station and to preservation. 40% of the respondents agree that attempts are already made to incorporate culture, mostly in the outdoor hut for relaxation and outdoor interviews. Few offices where designed with African culture in mind but not necessarily the host community cultural heritage

Table 2: Cultural features reflected on building design of the broadcasting station.

Cultural features	Number	Percentage (%)
Shape and geometry in accordance culture	10	40
Use of courtyard	20	80
Engravings	-	-
Cultural art works/ sculptures	15	60
Use of traditional building material	10	40

Table 2 shows cultural features used in the broadcasting stations. 5% agree that building is located close to a cultural or historical site of importance (NTA Lokoja studio located on Mount Patti Kogi).

Table 3: Reasons for the absence of cultural approach in the design of broadcasting station

Reasons	Number of respondent	Percentage (%)
High Cost of maintenance	23	92
Special labour which is no long common	14	56
Cultural element viewed as out-dated (modernization)	10	40
Strength of material and life span of material Structural problem	21	84
Limitation in design form	17	68

According to table 3, 92% of the respondents believe the high cost of maintenance is one of the major hindrance to incorporating cultural element in design of broadcasting station. 84% agree that the strength and life span of the materials is also a barrier to the integrating culture in broadcasting station design.

Table 4: Social sustainability indicator of broadcasting stations.

Social indicator	Percentage				
	Strongly agree	Agree	Neutral	Disagree	Strongly disagree
Social interaction	45	30	5	20	-
Social participation	-	38	-	62	-
Belief and identity	-	-	18	67	15
Social trust, and sense of belonging	-	22	41	37	-

Table 4 indicates the stations measured against social sustainability indicators. It indicates that building allows for social interaction between staffs but less with the host community. Only 30% of stations have facilities to allow for community participation and that is only on invite. 30% of the respondent disagree that the station provide any sense of belonging to the host community

CONCLUSION AND RECOMMENDATION

The research shows that culture is an integral part of any society and the media can promote or allow for continue loss of it. Cultural sustainability is necessary to give an identity to a society, the sense of belonging allows the society to be socially sustainable. Culture can be incorporated in the design of a broadcasting station without losing the function it performs to the society rather have it serves as a unifying tool. It is recommended that the national broadcasting stations in North Central Nigeria should be redesign to incorporate the cultural heritage of the people's history, to further identify as the people's broadcasting station.

Sustainable features of the traditional cultural architecture can be incorporated into the design of the broadcasting stations, communal arrangements of building to encourage interaction between staff and visitors, provide galleries spaces of cultural history and provide tour for visitors and use of locally sustainable building materials.

A society is never without culture, but the study has shown that its cultural heritage can be lost. The media as a proven tool for promoting culture must be used on every facet to protect and promote both the physical material and non-material culture of the society. The broadcasting station in Nigeria should make a point of duty to protect and promote the built cultural heritage of the host community. This will help increase its people's unity in the face of cultural and religious diversity in North Central Nigeria. Socio-cultural sustainability can only be achieved when the community, is allow participation and interaction with the local broadcasting station. This will further foster a sense of belonging as the station gives the community an identity by preserving its culture through its design.

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EVALUATION OF CRIMES, AND USER'S PERCEPTION ON PREVENTIVE MEASURES IN COMMERCIAL BUILDINGS IN NIGERIA

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Commercial buildings have always been a place of common interest among humanity throughout the ages. The exchange of goods and services for profit making is paramount among mankind. Criminals and offenders as such exploit any available opportunity within their reach to avail themselves with illegal or undue benefits if adequate crime preventive measures are absent. This necessitates the aim of the research, which is to identify crime preventive variables/measures required in the design and construction of commercial buildings to reduce the risk of crime situations; and the main objective to evaluate the degree to which the identified variables/measures is reliable and necessary for crime prevention in commercial buildings. The methodology used was to study and analyze the concepts of the theories Crime Prevention through Environmental Design (CPTED), Situation crime prevention (SCP), and Crime Pattern theory to identify crime prevention variables/measures. The identified variables were then converted to structured questionnaires using the Likert scale measurement to obtain users perception on the reliability and necessity of the variables/measures in crime prevention in commercial buildings. The findings from the study would equip and serve as a template for architects in the design and construction of comfortable and safe commercial buildings.

Keywords: Crime, Crime preventive measures, Commercial buildings

INTRODUCTION

Architects and Criminologists have continually propose various alternatives to crime prevention in commercial buildings due to the necessity of securing lives and properties of persons in such locations known to be hotspots for crime. This concern has lead to the development of various theories such as Crime Prevention through Environmental Design (CPTED), Situation Crime Prevention (SCP), and Crime Pattern theory Crime among others. Renowned criminologists such as Benneth (1986) and Bright (1992) were of the view that the motivation to commit a crime is not constant or beyond control rather it is dependent on a calculation of costs and rewards involved and expected.

Over the last decades, Nigeria has immensely suffered both nationally and internationally from crimes of various degrees. Internationally recognized crime watchdog; Transparency International have continually ranked Nigeria amongst the bottom ten most corrupt countries in the world. The effects of this menace is quite known to all Nigerians home and abroad; those abroad suffers inferiority complex and bad perceptions from the outside world, while those within the nation suffers the effects of the few who enrich themselves illegally to the detriments of others. This has created concerns amongst all categories of individuals both the lead and the leaders. The former president, Dr. Goodluck Ebele Jonathan and his then cabinets headed by the Late Mrs. Dora Akunyile introduced the campaign on rebranding Nigeria with the theme 'Good people, Great nation'. The present administration of president Muhammadu Buhari continued in the campaign with the theme 'Change begins with me'; stressing the need for every individual to act in his/her own capacity in the fight against crime.

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Crime is a conduct, behavior or an act that violates the criminal law, formal or written laws of a state for which a punishment is prescribed. It has an inherent geographical quantity, when crime occurs it happens in a place with a geographical location. Brantingham and Brantingham (1993) summarized that crime is an event that occurs when someone having the willingness to act against the law of a state comes across a target judged suitable to activate such a potential. The keywords in the meaning of crime are the law, the offender (actor), the target and the location. The action done by the offender must be against the criminal or formal law of the people of that geographical location or state. The motive of the offender would be what justifies the nature of punishment that is finally meted on the offender. An example of this scenario is; in the Kingdom of Saudi Arabia it is a crime for a woman to watch a game in a public place such as a stadium or a cinema but in Nigeria a woman can even perform in a show in a cinema or in a stadium. Furthermore, in northern Nigeria such as kano state and recently Niger state, it is a crime for any person to sell alcohol in commercial buildings except in barracks where as in southern Nigeria such as Delta and Abia state, people sell and drink alcohol in commercial centers such as shopping malls. Hence, one must understand the concept of crime within the geographical area before proposing crime prevention measures in the region.

Therefore, Architects who are pioneers in creating buildings must understand the context of crime and put into consideration appropriate crime prevention measures in the design and development of commercial buildings to enable comfort and peace of mind of all individuals.

Nature of Crimes in Commercial Buildings

Crimes occur in different places at different times. They could be in residential buildings, educational buildings, office building or commercial buildings. However, the nature of crimes in the various locations would slightly differ from each other. Environmental criminologists have always categorized crimes with the type of buildings and the motives of offenders. This is because in each situation the targets would vary; the procedure changes and then the opportunity to actualize such target differs. The establishment of agencies such as standards organization on Nigeria (SON), National drugs law agencies of Nigeria (NDLEA) and National university commission (NUC) are proof that crimes are categorized by motive of offenders and type of building. Educational buildings such as universities, examination malpractices is an issue which crime preventers work upon, NUC becomes a stakeholders to modulate such a crime but in commercial buildings such as a supermarket, selling of fake products is an issue and SON becomes the agencies to regulate such a crime. It therefore becomes necessary for crime modulators and crime preventers to have basic knowledge of the nature of crimes prone to the facilities they protect.

The natures of crimes associated with commercial buildings are similar to each other anywhere around the globe. As such in planning for security and crime control in such buildings priority must be to curb such reoccurring crimes. Geason and Wilson (1992) of the Australian institute of criminology listed burglary, armed robbery, violence, assault, theft, shoplifting, pick pocketing, fraud, loitering, vandalism, drug selling/consuming, graffiti, negligence on duty and stock shortages on delivery as crimes prone to commercial buildings. Brantingham and Brantingham (1993) however grouped the nature of crimes associated with commercial buildings to be infliction of injury or death of persons, burglary crimes, employee crimes and theft crimes. Cleen foundation (2012) in a victimization of household members in Nigeria listed armed robbery, burglary, physical assault, violence and theft to be the major crimes associated with commercial buildings. Offenders in these crimes cut across customers, managers and tenants in commercial buildings. Therefore preventive measures should be targeted in controlling each individual category of persons for more efficient and purposeful crime preventive measures.

Crime Preventive Measures

Crime prevention through environmental design (CPTED) is theory developed by architects and criminologists to minimize crime through the design of a facility or a town. It constitutes the following concepts;-

1. Territoriality which includes measures taken to secure the territory where the facility is located with the aid of perimeter fence, buffer areas, elevated planter or rail, signage's and electric fence such that it depicts to any person that such a property is owned by someone. The basic concept of Territoriality is to reinforce the sense of ownership of a space and preventing illegitimate users' access to such a space.

2. Surveillance (formal & informal), it includes measures adopted to ensure that persons and vehicles that move about buildings are been monitored. Painter and Tilley (1999) were of the view that crime control measures adopted in surveillance could be both passive and active. Passive such that the building form is such a way that allows maximum vision of the occupants and users of the facility and active such that it allows easy vision of maximum areas captured by cameras situated at various points in the building for security personnel's to easily monitor users. The physical building design either formal or informal has the capacity to promote surveillance opportunities among managements and security personnel's. Offenders desist from crime if they perceive or know that they are being observed.
3. Access control measures are principles adopted to checkmate movement of person either by vehicles or by pedestrian in accessing the building facility for any criminal purpose. It includes use of bollards, chicanes, window caches, high resistant and building component that make it difficult for offenders to be able to actualize their target.
4. Image/Maintenance within a built environment transmits positive signal to members of the society. It promotes positive image and eliminate the fear of crime. Gardiner (1978) stated that facilities or buildings whose physical environments are routinely maintained have being observed to have significant effects in reduction of crime.
5. Activity supports are measures adopted to ensure that activities in the building and the building surroundings are supportive to each other; such that clash of interest would not become a problem among users and occupants in the building. Example is having a clubhouse in a shopping mall.
6. Target hardening involves measures adopted to ensure that targets of offenders are very difficult to be actualized. It includes removing cash/ money from where they are expected. Using highly resistant burglar and bulletproof building components and securing the building envelop. Target hardening is the foremost approach to crime prevention; it focuses on denying access to the targets of criminals using physical barriers such as fences, gates alarms, locks and security patrols.

The effectiveness of these measures in crime prevention has been acknowledged by researchers and crime modulators across the globe. Each concept in the theory is complimentary to the other and acts as a body in preventing criminal situations. Cisneros (1995) opined that this location-based crime prevention strategy, crime prevention through environmental design (CPTED) emerged as an independent theory and is now increasingly being implemented worldwide due to successes recorded in crime prevention in its implementation. Researches conducted independently by Poyner and Webb (1992) and Geason and Wilson (1992) in commercial buildings revealed that crimes associated to commercial buildings can be prevented or minimized by the implementation of the concepts in the theory CPTED.

Situational Crime Prevention (SCP)

Situational crime prevention originated as a non-policing approach, but more broadly as a scientific approach to crime prevention. Joel and Michael (2009) observed that the approach focuses on reducing crime by designing safer environments and more secured consumer products. It shifts the crime prevention focus away from merely trying to deter offenders through punishment and rehabilitation, and toward convincing offenders that committing crime in a particular place is not worthwhile.

Architects and criminologists have outlined four (4) steps to prevent situational crimes which are:-

a) Increasing the effort to offend: - This involves creating various barriers and hurdles that must be accessed before an offender would be able to meet their target. It includes measures such as creating various checkpoints, using perimeter fencing at various points, inculcating access control measures using crash beams and bollards.
b) Reducing the rewards of offending: - This involves measures adopted to ensure that offenders pay heavily for offences committed, such that they regret committing such actions. When offenders happen to get away or pay little for their offences it tends to increase crime situations. This is because when offender knows they would pay a little it makes no sense to them to obey the law.

c) Reducing provocations to offend: - These are measure taken to ensure that all necessary facilities are provided and are in good working condition at all times to prevent provocation by users and customers to commit offences.

d) Removing excuses for offending: - These are consideration adopted to ensure that adequate information and warning are provided to individual to avoid excuses when a crime is committed, it involves providing signage at various point where necessary to pass information to users on the expected behavior of occupants at that particular location or spot.

The objective in situational crime prevention theory is to provide adequate information to users such that they realize that crime in such a place in worthless due to strict disciplinary measures in place among all users of such facility. Every person is aware of the expected behavior he needs to comply with and the consequences of falling short of it. As such they rather prefer to stay out of crime.

RESEARCH METHOD

The sampling method adopted for the population sample of the research is the Non – Random-sampling technique. Seven states and the federal capital territory were selected for the study. Two each from the north, south-east, and western parts of the country and one from the south-south and federal capital territory of Nigeria as shown in table 1 below. This was done to achieve an overview of perceptions of users on crime prevention measures used across the various cultural backgrounds of the people in the country.

Four hundred questionnaires was developed by adapting the concepts of the theories crime prevention through environmental design (CPTED) and situational crime prevention (SCP) strategies. The concepts which constitute among the followings; territoriality, surveillance, target hardening, access control, activity support, image/maintenance, and disciplinary measures, was then converted to the research variables using the likert scale measurement method. The structured questionnaires were shared fifty each for distribution to commercial buildings amongst eight research assistants whose education qualification ranges from Higher National Diploma (HND) to master degree from various fields of study to the seven selected states and the FCT. The research assistants were guided by the researcher to obtain required data's on user perception on the various crime control measures in commercial buildings. The structured questionnaires were distributed to shop owners, security personnel's and customers who are the main stakeholders in any commercial buildings. Two hundred and forty two (242) questionnaires from the four hundred questionnaires distributed was returned; of which eighteen (18) were not properly filled (not filled); and so was not used for tabulation in the research. The questionnaires returned when sorted out consisted of one hundred and two (102) customer respondent, fifty four (54) security personnel's respondent, and sixty eight (68) shop owner respondent, making a total of two hundred and twenty four (224) respondents.

The data's obtained was then analyzed using the Likert scale measurement method. A weighted scoring of 1-4 was apportioned to the different options for choice for the respondents based of their perception on the reliability and necessity of the crime prevention measures/variable in commercial buildings. The scoring of the options is; Strongly agree (4); Agree (3); Disagree (2); and Strongly disagree (1). Tables and charts were then produced to show the results for the research.

Table 1.0: Datas of respondents obtained from the questionnaires

Name of states	Questionaires used	Customers	Shop Owners	Security Personnel's
1) Niger State	38	17	12	9
2) Kaduna State	26	14	7	5
3) Ondo State	27	12	8	7
4) Lagos State	28	13	9	6
5) Enugu State	24	10	7	7
6) Abia State	25	12	6	7
7) River State	24	11	8	5
8) FCT	32	13	11	8
Total	224	102	68	54

DATA ANALYSIS AND RESULT DISCUSSION

The results from the research shows that the ranking of various category of respondents' perception on the reliability and necessity of the identified crime preventive measures slightly vary among the main stakeholders in commercial buildings. Customers' perceptions showed that surveillance was the most preferred crime prevention measure while security personnel's preferred access control to be the most reliable measure in crime control, but shop owners voted territoriality instead. However when combined and viewed together surveillances proved to be most absolute required measure in ranking among other crime control measures. The variables used and the responses from various users are shown in table 2.0 to 5.0. Tables 2.0 to 4.0 shows users response based on a weighted score using likert scale as discussed below, table 5.0 shows the cumulative responses of all users including the mean value and rankings in terms of users' perception on the reliability and necessity of the crime control measures.

Table 2.0: Customers Responses on the Reliability of the Crime Control Variables

Measured Variable	strongly agreee (4)	agree (3)	disagree (2)	strongly disagree (1)	Total
Rating on territoriality	25	54	19	4	102
Rating on access control	18	38	39	7	102
Rating on activity support	40	27	35	0	102
Rating on surveillance	**63**	9	18	12	102
Rating on image/maintenance	37	22	25	18	102
Rating on target hardening	28	54	15	5	102
Rating on disciplinary measures	18	15	49	20	102

Source**:** Author's fieldwork, 2017

Table 3.0: Shop Owners Responses on the Reliability of the Crime Control Variables

Measured Variable	strongly agreee (4)	agree (3)	disagree (2)	strongly disagree (1)	Total
Rating on territoriality	**38**	15	9	6	68
Rating on access control	27	20	17	4	68
Rating on activity support	17	29	12	10	68
Rating on surveillance	35	12	21	0	68
Rating on image/maintenance	18	12	27	11	68
Rating on target hardening	15	17	19	17	68
Rating on disciplinary measures	20	22	16	10	68

Source**:** Author's fieldwork, 2017

Table 4.0: Security Personnel's Responses on the Reliability of the Crime Control Variables

Measured Variable	strongly agreee (4)	agree (3)	disagree (2)	strongly disagree (1)	Total
Rating on territoriality	19	23	10	2	54
Rating on access control	**21**	13	9	11	54
Rating on activity support	13	19	4	18	54
Rating on surveillance	20	16	9	9	54
Rating on image/maintenance	17	15	15	7	54
Rating on target hardening	8	22	12	12	54
Rating on disciplinary measures	16	19	9	10	54

Source**:** Author's fieldwork, 2017

Table 5.0: Cumulative Responses by Respondents on the Reliability of the Crime Control Variables

Measured variables	Strongly Agree (4)	Agree (3)	Disagree (2)	Strongly Disagree (1)	Sum	Mean	Ranking
Rating on territoriality	82	92	38	12	692	3.09	2nd
Rating on access control	66	71	65	22	629	2.81	4th
Rating on activity support	70	75	51	28	635	2.83	3rd
Rating on surveillance	118	37	48	21	700	3.13	1st
Rating on image/maintenance	72	49	67	36	605	2.70	6th
Rating on target hardening	51	93	46	34	609	2.72	5th
Rating on disciplinary measures	54	56	74	40	572	2.55	7th

Source**:** Author's fieldwork, 2017

The results from the tables above using the weighted scoring method 1 – 4 as stated earlier above means that respondents views on the reliability and necessity of the above mentioned

crime control variables ranges between the mean value of 2.55 to 3.13. The interpretation of the results using the mean value is stated below:-

Absolutely necessary and reliable	3.00 – 4.00
Necessary and reliable	2.00 – 2.99
Not necessary but reliable	1.00 – 1.99
Absolutely not necessary and not reliable	0.00 – 0.99

The table 5.0 reveals that the rating on surveillance and territoriality is 3.13 and 3.09 respectively, and ranks 1st and 2nd among the other variables. The interpretation from the analysis of the results as such means that majority of the respondents feels that surveillance and territoriality are ***absolutely necessary and reliable*** in crime prevention in commercial buildings.

However, the mean value from the other crime control variables ranges from 2.83 to 2.55, with the interpretation meaning ***necessary and reliable***. The rankings reveals that respondents viewed activity support, access control, target hardening, image/ maintenance and disciplinary measure to be 3rd,4th, 5th,6th and 7th respectively. The result shows that all indentified crime control variable are necessary, however priority has to be given to surveillance and territoriality in planning for security in commercial buildings.

CONCLUSION

Crime is a social problem and criminal or offenders continually develop different strategies to enable them achieve their targets, as such crime prevention programmes must also continually improve the methods they adopt to stand the challenge of controlling criminal situations. Criminals find solace in places where valuables or items of common interest are situated such as commercial buildings. Hence, there is need to secure them. Crime occurs when the opportunity is provided; that is when adequate measures to prevent crime are not provided, it becomes favorable for criminals or offenders to actualize their targets in such locations. The translation of the concepts in CPTED and SCP theories, which are well known and acknowledged by security experts and psychologists in crime prevention into specific security design features in commercial building would enable effective resistance against offenders in any crime situation especially in hot spots such as commercial buildings which have been proven to be hotspot for offenders or criminal. Therefore, stakeholders and planners of the built environment such as Architects and Builders must be able to put in use effectively the various crime control concepts or variables in a proportion that would deter offenders of whatever motive or target to engage in crime. The need of a balance in the application of the crime prevention measures is keys to the success of crime control and users acceptability of the buildings. The wrong use of the crime control variables/measures would lead to dissatisfaction by either of the stakeholders in commercial building such as customers whose satisfaction is one of the main priorities in commercial buildings or even the shop owners. Hence, the need for this research evaluation of crimes and user's perception on preventive measures in commercial buildings.

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CROWD CONTROL IN PUBLIC BUILDING DESIGNS: CURRENT TREND AND STRATEGIES FOR ECCLESIASTICAL BUILDINGS IN ABUJA, NIGERIA

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Generally, every public building design requires the consideration of the interaction of people with each other and the space to ensure the user's safety. Observations have also shown that conglomeration of a large number of individuals per space often times proved a potential circulation threat. This factor thus necessitates measures to manage and control the movement of people around and within public building as well as catering for emergency evacuation of the crowd. A major challenge to achieving this is observed in places of worship in Nigeria with two major religions. This paper aims to assess the practices in measures for passive crowd control design with emphasis on design for crowd evacuation in large capacity ecclesiastical buildings in Abuja, Nigeria. The objective is to enhance safety and security through improved design of ecclesiastical buildings to better cope with a large crowd in extreme events. The methodology being descriptive survey method are founded on extensive literature review, observation of specific features and physical measurement of elements being evaluated in the buildings. Findings from this study highlight the deficiency in ecclesiastical building design, develop design strategies for direction in crowd control and make recommendation to improve design for safety and security during events and emergency in such public places. The paper concludes the need to develop guidelines for designing ecclesiastical buildings in Nigeria with specificity for crowd control whilst recommending that due attention be given to the adequate proportion of occupants to an area of space to avoid crowd congestion or constipation.

Keywords: *crowd control, ecclesiastical buildings, emergency evacuation, extreme events.*

INTRODUCTION

Ecclesiastical buildings are public buildings as well as religious buildings that are built to domicile Christian worshippers as they congregate for the said purpose. From its beginning, a critical part of Christianity has been the gathering of people worshipping together. By virtue of this activity, the "place" where they worship has become endowed with a symbolic form (Wardell, 2004). A major challenge being posed to designers of large capacity structures is their ability to control the circulation of the users of such spaces due to the enormity of the crowd required to utilize the structure per time. The fundamental principle for safety in built environment is to ensure that the occupants in a building are safe during emergency events as well as the normal conditions.

The contributions of architects for disaster management can have various approaches from producing short-term solutions to long term actions for future developments such as building new disaster resistant buildings or rebuilding damaged structures after the formal assessment of damage in the built environment (Brown and Downey, 2006). Improvements in building construction and services need to be supported by an efficient building layout design based on the interrelations of functions in the building, circulation, and occupant characteristics to mitigate the impacts of extreme events on people (Sagun *et al.,* 2014).

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Nigeria, being well known for their zeal to religious activities, and having two major religions (Christianity and Islam) with Christians summing up to about 40% of the total country's population according to Pew Research Centre, are often posed with potential crowd disasters in their Christian gatherings. Due to the ever increasing population of membership of denominations, it becomes more difficult to solve existing challenge of crowd movement. In addition to that, due to recent terrorist attacks on church buildings in northern Nigeria, there is a need to review emergency evacuation parameters in existing church buildings to ensure optimum design considerations for crowd evacuation.

Evolution of Ecclesiastic Architecture

Wardell (2004) gave a timeline evolution of church architecture highlighting the peculiarity of each of the periods.

- **The House Church (from AD 30):** To the early Christians the word "church" referred to the act of assembling together rather than to the building itself. As long as Christianity was unrecognized by the Romans, Christians met where they could, mainly in their own homes.
- **The Basilica (4th century AD):** As the church began to grow, the was need for expansion of their house church meetings or the development of an entirely new structure to meet their current population standard, s thus there was the inception of new architectural style called the basilica which was a more formal worship structure.it gave emphasis to interior lightings and ornamentation.
- **The Monastery (344-800AD):** with the fall of the roman empire and the rise of Christianity, the influences of the roman architectural philosophy on church architecture waned off and was replaced by a more spiritually expressive design concept. The architecture of this period clearly and coherently express that order. The new civic order, was founded upon and integrated with Christian values; it was, at once, grounded and spiritual. The town is an extension of the monastery and, as such, it manifests the Christian inward focus: it is a self-sufficient and walled entity with the church as its core.
- **Gothic and Romanesque Church Architecture (800-1450 AD):** Where previously the dome at the crossing had represented the revelation of God in a discrete location, in Romanesque and especially Gothic cathedrals that revelation is symbolized by a verticality that is extended into the entire nave. Clerestory windows and vaulted ceilings intensified the connection to the sky and de-emphasized the material presence of the building. In the Gothic cathedral, God's presence is immediate and, through the cathedral, He communicates very directly with mankind.
- **Renaissance Church Architecture(1400AD)**: In this age of investigation and discovery, men sought to integrate a realistic approach to nature with an idea of divine cosmic order. As in other ages the church sought to represent this search in the architectural expression of their building. Interior and exterior space was clearly defined and design of these areas was carved out with an emphasis on mathematic geometry, a symbol of man's reason expressing God's order. The town itself was similarly conceived with an organization gathered around a central piazza. From this place, an orientation was established that could locate the major streets and public buildings of the town the church occupied. The church, as one of these major points, however, shared its pre-eminence with important civic structures of the community.
- **Modern/Contemporary Church Architecture (1972 to present):** the modern and contemporary church buildings are upshots of the modernist and postmodern architecture. The modern church style employs an architectural form hinged on a basic shape, with facades consisting of reinforced concrete material ornamented for aesthetic purpose. The entire outlook of the church carries the basic features of a quintessential church structure existing at that time. the post-modernist idea on the design of a church structure on the other hand employs the use of visually light materials such as the glass facades, contemporary façade finishes such as titanium.

The Concept of Crowd Control

The term 'crowd control' literally means measures put in place to keep crowd orderly. This definition however does not specify the approach or method adopted in the quest to keep crowd orderly, whether actively or passively. Passive crowd control design is the integration of architectural elements features and principle to control crowd in both normal and extreme (emergency) conditions (Winter, 2012). This definition highlights two distinct situations that warrants passive crowd control design measures: normal and emergency conditions.

Crowd control during normal conditions are meant to incorporate features required for crowd comfort, restriction of crowd from unwanted positions, ease in circulation, while emergency conditions focuses on features responsible for crowd evacuation within the shortest possible time. According to Maslow's hierarchy of needs, safety and security constitute the second level of human

needs after physiological needs, hence more attention is required to be given to passive design measures necessary to achieve crowd safety. Winter (2012) identified two major factors that contributes to the evacuation of people in public space namely building design and the behaviour of crowd in times of emergency.

Historical Occurrence of Crowd Disasters

Crowd disasters have been quite a common occurrence in different parts of the world. below are a few accounts of crowd disasters that have occurred in a descending order of occurrence. In the year 2017, eight people were killed and 60 seriously injured in a stadium crush in Demba Diop stadium in Senegal. (Al Jazeera, 2017). In 2016, at least 52 people were killed during a thanksgiving festival in Ethiopia from human stampede (BBC news, 2016). In the year 2015, no fewer than 19 people died after a stampede that occurred in a football match in Cairo Egypt. (Maher H, 2015). In the year 2014, Tragedy occurred when about 16 to 24 recruits were killed and more than 119 were injured at several stadiums and other centres across the country of Nigeria.in many security forces fired their rifles to the air causing panic and leading to stampede. (Newswatch Times, 2014). In the year 2013, 10 people were killed and 120 injured in Launda, Angola, when they tried to enter the Estadio da Cidadela for a new year's eve vigil that was already overcrowded. (BBC news, 2013)

Crowd Density

Crowd density is the level of concentration of people in a given space it can be mathematically said to mean the number of people per unit area of a space. Crowd density is a vital factor in circulation crowd as well as emergency evacuation of crowd during extreme conditions. Standards have been put in place as to the maximum number of people required in a space. According to events management book, the standard crowd density for a seating crowd is 1person per square meter (1 per/sqm). However, determining the right crowd density for a space goes beyond adhering strictly to these standards, the architects and engineers have to make extrapolations as to other factors affecting crowd evacuation of the space designed for and possible run a simulation test.

Crowd Dynamics

Crowd dynamics is the study of the movement of people: how, when and where crowds are formed and how they move. The behaviour of people may be affected by the conditions of their immediate environment as a result of interactions with the space and the behaviour of the other people. There may be spreading over the space in large environments and compression of groups of people in small spaces. The density of the surrounding crowd affects the speed of each person and individual behaviours due to personal characteristics and their response to environment can be included to modify the locomotion (Lo *et al*., 2002). Moreover, the behaviour of crowds show different characteristics compared to individual behaviours and the behaviour of people during disasters differs from that of normal conditions. People do not like interruptions and interference with their activities and lives, so they would follow routines and see warning s as an "exercise" ignoring the signs in order to continue with their normal behaviour when they face d with a disaster (Boer and Skjong, 2001). After an emergency alarm, occupants may perform various actions such as searching for something/someone around, warning other people, etc. before moving to escape routes. During unexpected events, the attention of people increases, however expectations can direct them to use less than the available information (Weick and Sutcliffe, 2001). Decisions by users of the space are based on their current knowledge which may be limited or incorrect.

Crowd management

Crowd management is the process of controlling the behaviours of large groups of people for their safety and security. It involves planning, organization, guidance and evaluation activities (Sagun *et al.*, 2008)**.** Crowd safety and security in public areas are primarily the organiser's or operator's responsibility. A health and safety management system is required to monitor and control potential crowding risks in public areas. The four interacting elements that need to be put into consideration to minimize injuries and death during crowd situations are defined as: time, space, information and energy by Fruin (1984). He explained time as the period of crowding; space as the layout and size of the occupied area; information as the perceptions of the people in the crowd to take some group action; and energy as the pressures created by the mass of people that can cause accidents and death. Within this context, crowd management considers the elements of events where crowds are involved dealing with the facility, size, behaviour of the crowd, means and routes of entrance and exits, communication, jamming and queuing. Another fact observed from the crowd incidents is that different types of crowds behave in different ways during disasters. It is essential to have information on different types of occupy ants (in terms of age, sex, abilities, etc.) to anticipate the problems. For instance, violent behaviours of fans can be a potential risk in sports venues, trying to evacuate people in a residential building during sleep time can slow down the rescue process.

Basic Crowd Control Design Measures in Large Capacity Buildings

As afore said, safety of crowd in large capacity buildings is of high importance. The requirements for crowd safety in large capacity buildings conflict with those required for security, as the initial

seeks to increase modalities for ease in movement while the latter seeks to restrain and monitor movement (Billington *et al.,* 2002). Thus proper synergy between security and safety has to be achieved to ensure a logical balance. According to Daoliang *et al.,* 2006 and Helbing *et al.,* 2002 the three most important factors that can cause reduction of evacuation time in large capacity buildings are the placement and width of exits and the placement of environmental objects. Sagun *et al.* (2008) enumerated the design variables to consider when addressing the issue of passive crowd control.

1. Size and capacity of the building
2. Characteristics of entrance to the building
3. Building layout.
4. Number of routes and doors
5. Dimension of the routes and doors

RESEARCH METHODOLOGY

Descriptive survey method was used on the selected church buildings in Abuja. Owing to the fact that the variables for evaluating passive control design measures are physically measurable variables, observation schedule was used which also involved the physical measurement of linear variables (length, breadth, depth). A total of 10 samples were selected from a study population of 447 churches using stratified purposeful sampling method which according to Palinkas (2013) will provide variation in the sample selected bringing to bear some specific features the researcher wishes to observe in the selected population sample. In this vein the criterion for selection of samples is the seating capacity of the churches, choosing a minimum requirement of 1000 seating capacity for the selection of samples. This was to afford the researcher a wide range of passive crowd control design features required to be evaluated. It is also noteworthy that no 2 churches were selected from the same denomination as this stratified sampling technique afforded the researcher a variety of design typologies as are obtained from the different samples selected.

Table 1. Churches studied

	Name of churches
1	National Ecumenical Centre, Central Area, Abuja
2	Champion's Royal Assembly, Chikakore, Abuja
3	Holy Trinity Catholic Church Maitama Abuja
4	Living faith church Dutse, Abuja
5	Redeemed Christian Church of God Kubwa, Abuja
6	ECWA Blantire, Wuse, Abuja
7	St Bartholomew Anglican cathederal, kubwa, Abuja
8	Common Wealth of Zion Assembly, Guzapei Hills Abuja
9	First Baptist Church Garki Abuja
10	Dunamis International Gospel Centre, Area 1, Abuja

RESULT AND DISCUSSION

Capacity of Church Building

Capacity of the space has a strong influence on the crowding (Fruin, 1993) and bottlenecks because as Casburn *et al.,* (2005) stated that people spread out when there is enough space to avoid collisions and they bunch up without intersecting at bottlenecks. The capacity of an enclosed space is the first factor to consider when designing for crowd control.

Table 2: Capacity of Church Building

s/n	**Name of church**	**1000-2500**	**2501-5000**	**5001-10000**	**10001-20000**	**Above 20,000**
1	National Ecumenical Centre Abuja					
2	Champion's Royal Assembly, Chikakore, Abuja					
3	Holy Trinity Catholic Church Maitama Abuja					
4	Living faith church dutse, abuja					
5	Redeemed Christian Church of God Kubwa Province					
6	ECWA Blantire, Wuse					
7	St Bartholomew Anglican cathederal, kubwa					
8	COZA Guzapei Hills Abuja					

9	First Baptist Church Garki Abuja					
10	Dunamis International Gospel Centre, Area 1, Abuja					
	Percentage(%)	30%	60%			10%

Number of Seats per Seat Clusters

Large capacity auditoriums arrange their settings in smaller clusters with aisles between them for circulation. The smaller the capacity of such seating clusters, the more circulation spaces are created and the less congestion is likely to be experienced.

Table 3: Number of Seats Per Seat Clusters

s/n	Name of church	Below 25	25-50		51-75	76-100	Above 100
1	National Ecumenical Centre Abuja						
2	Champion's Royal Assembly, Chikakore, Abuja						
3	Holy Trinity Catholic Church Maitama Abuja						
4	Living faith church dutse, abuja						
5	Redeemed Christian Church of God Kubwa Province						
6	ECWA Blantire, Wuse						
7	St Bartholomew Anglican cathederal, kubwa						
8	COZA Guzapei Hills Abuja						
9	First Baptist Church Garki Abuja						
10	Dunamis International Gospel Center, Area 1, Abuja						
	Percentage(%)	10%	20%		30%	30%	10%

Average Crowd Density Per Seating Cluster

Crowd density shows the extent of concentration of a population per space. This is a derivative of dividing the number of seats in a cluster by the floor area of that cluster. According to Emergency Planning College Handbook, standard Crowd density for people seating is 1 person per square. meters. 47 people per 10 square meters for people standing and 10-15 persons per 10 square meters for easy circulation of people. This is also regarded as critical mass. A value which if exceeded, poses a potential threat to the safety of the occupants of that given space.

Table 3: Estimated Average Crowd Density Per Seating Cluster.

s/n	Name of church	1 head and below per m^2	3 heads per $2m^2$	2 heads per m^2	3 heads per m^2
1	National Ecumenical Center Abuja				
2	Champion's Royal Assembly, Chikakore, Abuja				
3	Holy Trinity Catholic Church Maitama Abuja				
4	Living faith church dutse, abuja				
5	Redeemed Christian Church of God Kubwa Province				
6	ECWA Blantire, Wuse				

7	St Bartholomew Anglican cathederal, kubwa				
8	COZA Guzapei Hills Abuja				
9	First Baptist Church Garki Abuja				
10	Dunamis International Gospel Center, Area 1, Abuja				
	Percentage(%)		10%	60%	30%

Emergency Evacuation Rate of auditorium Per Time.

This analysis is an extrapolation of the obtained data (entrance/exit and capacity of the auditorium.) to derive the emergency evacuation rate of the building per unit time.

Table 4: Emergency Evacuation Rate of auditorium Per Time.

s/n	**Name of church**	**Capacity of church auditorium**	**Average door width(mm)**	**Number of doors provided**	**Total entrance / exit width(m)**	**Carrying capacity of entrance/exit (no of persons per unit time)**	**Ratio of capacity of church to capacity of entrance per unit time**
1	National Ecumenical Center Abuja	3000	3600	8	28.8	32	1:94
2	Champion's Royal Assembly, Chikakore, Abuja	80000	1500	12	18.0	20	1:4000
3	Holy Trinity Catholic Church Maitama Abuja	3000	1500	12	18.0	20	1:150
4	Living faith church dutse, abuja	2000	1800	6	10.8	12	1:167
5	Redeemed Christian Church of God Kubwa Province	1200	1800	4	7.2	8	1:150
6	ECWA Blantire, Wuse	2000	1800	6	10.8	12	1:150
7	St Bartholomew Anglican cathederal, kubwa	1500	1800	5	9.0	10	1:150
8	COZA Guzapei Hills Abuja	2000	1500	4	6.0	6	1:333
9	First Baptist Church Garki Abuja	1500	1500	3	4.5	5	1:300
10	Dunamis International Gospel Center, Area 1, Abuja	1800	1200	4	4.8	5	1:300

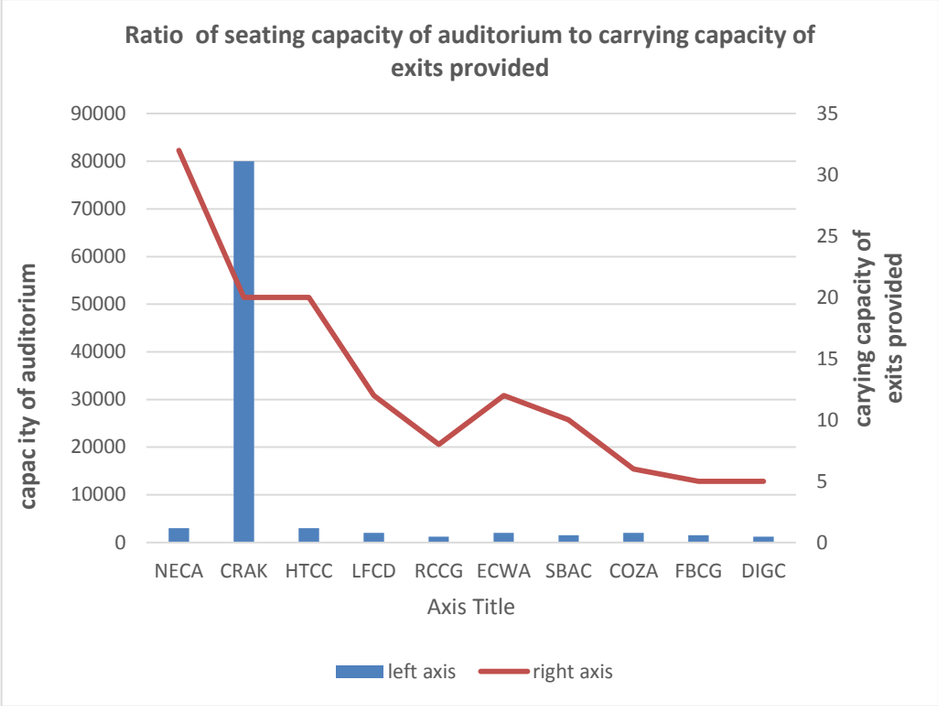

Fig 1. chart showing the ratio of seating capacity of church auditorium to the carrying capacity of exits provided.

Results of this analysis shows the ratio of capacity of the church auditorium to the carrying capacity of the accesses (entrance and exit doors) provided.ie for the national Christian centre, for one person exiting the building during emergency evacuation, there is a potential queue of 94 people waiting to use the same exit. This gives a projection of what is likely to occur during emergency evacuation the church auditoria evaluated in their full capacity.

Fig 1 comparatively illustrates the ratio of the church capacity to the total carrying capacity of the exits provided per time.

Presence of Obstructions at movement path

The presence of elements that constitute obstructions at movement path is an inhibitor to the optimum circulation and emergency evacuation of crowd. Winter (2012) opined that placing a column at the exit point of building is a counter intuitive measure that could increase the perceived danger of an individual, which could lead to more danger than if there was no column at all

Table 5 shows the presence of obstructions along movement path

s/n	Name of church	present	absent	Nature of obstruction
1	National Ecumenical Center Abuja			Structural column
2	Champion's Royal Assembly, Chikakore, Abuja			Structural column
3	Holy Trinity Catholic Church Maitama Abuja			Structural column
4	Living faith church dutse, abuja			
5	Redeemed Christian Church of God Kubwa Province			Structural column
6	ECWA Blantire, Wuse			
7	St Bartholomew Anglican cathederal, kubwa			
8	COZA Guzapei Hills Abuja			
9	First Baptist Church Garki Abuja			Structural column
10	Dunamis International Gospel Center, Area 1, Abuja			Structural column
	total	60%	40%	

It is noteworthy that the movement obstruction constituted by the structural columns supporting the galleries was not their presence but their location or positioning with respect to circulation aisles.

CONCLUSION AND RECOMMENDATION

In adequately solving the problem of crowd control in large capacity public buildings, integrated approach needs to adopted. The evaluation conducted in this research was mainly on the existing features and parameters used in the design of the church auditoriums so assessed. The variables appraised were such influencing passive crowd control design and design for emergency evacuation of crowd. Findings from the evaluation conducted in this research provides a rationale for the following recommendations:

There is need for the designers of large capacity spaces to do an adequate appraisal on the capacity of seating clusters the church auditorium as this is a key factor that influences the level of crowd congestion in the aisles as well as the success of emergency evacuation of crowd during extreme situations. Also, for effective crowd circulation and emergency evacuation, the required crowd density for a given space has to be calculated while determining the capacity of a church auditorium and known so as to avoid potential congestion. Priority should be given to crowd safety over space maximization when determining the type of seats to be specified for large capacity buildings. From the researcher's observation, the pew seating type are the ones likely to be overloaded because there is no demarcation on them. Thus, seating arrangement should be properly monitored to prevent overcrowding. Attention should be given to the positioning of permanent design elements that could constitute movement obstruction of people especially during emergency evacuation of crowd. Findings from this research revealed that the major source of movement obstruction is from the positioning of the structural columns supporting the suspended gallery floors with respect to the circulation aisles. Thus, there have to be a synergy between structural design and interior design/furniture specification and arrangement.

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INTERGRATION OF GREEN DESIGN PRINCIPLES IN CIRCULATION SPACES OF SHOPPING CENTERS, ILORIN, NIGERIA

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In recent years, sustainability has become a common interest of numerous disciplines. Sustainable architecture or green design is an approach that strives to minimize the number of resources consumed in use and operation of a building, so also curtailing the harm done to the environment through the emission, pollution and waste of its components. Circulation is taken as top priority to achieve convenient shopping experience. Observations have shown that most circulation spaces are hard landscape and this generates heat in buildings. In addition, the mechanisms by which green design elements can be used to improve energy saving in buildings are considered. These include vegetation for shading, insulation, evaporative cooling by evapotranspiration, and the barrier effect to the wind. The aim of this study is to examine ways of integrating green design elements in circulation spaces of shopping centres in Ilorin, Nigeria. The research adopted a mix-method approach with the use of observation schedule and structured questionnaire. The data obtained was analyzed using statistical tools and content analysis. The paper recommends the integration of green design in circulation spaces of shopping centres with focus on energy saving, aesthetics and sustainable shopping experience in order to reduce heat gain, enhance air purification and further maximize the eco-friendliness of shopping centres.

Keywords: Green Design, Circulation Spaces, Shopping Centres, Sustainability, Ilorin.

INTRODUCTION

High building performance, green design practices and building sustainability are positively impacting on architectural practice around the world. This is setting a new standard in the construction industry. The grow interest and demand on the part of both the public and private sectors, multidisciplinary professionals from architects to environmental managers, landscape architects and beyond are redefining the ways we look at design and its impact on environment. The simplest concept of sustainability is design that meets the needs of the present generation without compromising the ability of future generations to meet their needs. Linda S. V (2005) defines green building as the practice of improving the building efficiency within its site in relation to energy use, water and materials and minimizing the building impacts on human health and the environment. The Principles and processes of green design begin with an intimate understanding of the site and building in beauties, functionalities and complexities. Designers can create building features mimicking the function of particular ecological system (e.g Landscape). Thomas (2009), says creating new habitat on structure in urbanized areas is especially important to support bio-diversity and health ecosystem. Amany, Hisham & Ghada, (2016); Peter, Ezekiel & Paul, (2012) summarize green design principles into sustainable site design, landscape design, water conservation and quality, energy and environment (improved energy and efficient use resources), indoor environment quality (avoiding pollution, protecting and enhancing bio-diversity) and conservation of material and resources (recycling and waste management) with key action to economical, environmental and social sustainability.

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Oyebode & Isah, (2018). **INTERGRATION OF GREEN DESIGN PRINCIPLES IN CIRCULATION SPACES OF SHOPPING CENTERS, ILORIN, NIGERIA.** Contemporary Issues and Sustainable Practices in the Built Environment. School of Environmental Technology Conference, SETIC, 2018

Burcu, (2015) says planned landscape helps to maximize passive solar energy, minimize air pollution to natural habitat and promotes environmental friendly architecture. The use of green design principles with focus on landscape can help further the goals of maximizing eco-friendliness on the built environment.

This paper presents an overview of green design principles as regards landscape concept in circulation spaces and human desire to connect their built environment with nature. The ecological, economic, aesthetics and psychological advantages that landscape offers to both users and owners of the building.

General Concept of Landscape Architecture

A building, with all it sophistication in design as may be applied will not achieve its full design performance if its surrounding environment is not considered during the design process. In designing the surrounding landform, first the welfare of the inhabitants and users of the outdoor facilities within the area is a major factor of consideration.

Dewayne (2003) defines landscaping as the art and science elements of creating a functional, aesthetically pleasing extension of indoor living to the outdoors. Landscaping is that aspect of architecture involving an artistic and scientific approach in designing the natural landform. The sole purpose of landscape architecture is to enhance the environment and make it a much natural place for human and other biotic inhabitation giving the destructive effect of human activities may cause on the natural environment.

Landscape architects begin with the natural terrain and enhance, re-create, or alter existing landforms. Garden generally connotes a smaller, more intensively cultivated area, frequently created around a domestic building or other small structure. Landscape denotes a larger area such as a park, urban area, campus, or roadside.

The major elements of art as landscape principle are colour, line, form, texture and scale (Dewayne 2003, Gail 2016). The principle of design (scientific) must also be considered in the landscape process, unity, balance, transition, focalization, proportion, rhythm, repetition and simplicity interact to yield the intended design (Gail 2016).

Landscape architecture entails two aspect of design approaches which are the artistic design approach and the scientific design approach.

In artistic approach to landscape, design is the quest to bring or manipulate the combination of the various elements that are found within the vicinity and application of art and design principles to produce an aesthetic appeal and styles. The landscape is composed of varying range of natural and artificial elements. The artificial elements are man-made features such as walkway pavement, fountain, poles swimming pool and building structure. Natural elements are landscape features that exist naturally and could range from non-living features like rock, hill water bodies (pond, streams) and vegetative features like grass, shrubs and trees.

In scientific design approach, ecological factors and problem that may arise on the site initiate design analysis. With rising concern for energy depletion and environmental hazard, green design approach are major tools for scientific assessment on landscape architecture. Scientific approach is used as a tool to achieve sustainable architecture in the field of landscape and ecological conservation (Michael et al 2007). Ecological conservation in landscape architecture recognizes the various resources that abound in the natural environment, amount available (limited or in abundance) and various possible ways that human activities might affect the surrounding environment which we engage with this resources. Through green design approach, the natural landscape and its resources will be well managed and other component of the ecosystem will be conserved.

These elements and principles of design are particularly useful when creating spaces as they help to define it, add interest and create a unified, functional and aesthetically pleasing landscape. Landscape Design Process (Gail 2016, Dwanye 2003) categorises the design process for landscape in six major steps: conducting site inventory and analysis, determining your needs, creating functional diagram, developing conceptual design plan, drawing a final design plan, plant selection and placement.

Landscape Design Principles for Circulation Spaces in Shopping Centres

Dewanye (2003) refers to circulation as the movement of people's eyes and then their bodies through a specific pattern in the landscape. There are many issues to be considered in the

circulation space of a shopping centre such as the volume of pedestrian, frequency of activities and the types of activities which are determining factors for how the landscape of the exterior view is to be designed. For landscape design factors include; Patterns of movement, which is determined by the type and location of the activities, the ratio of exterior space to the building interior, maintenances viability of the landscaping elements, ecological and micro-climatic setting.

Vegetative elements

Domestic building is more defined by private life, vegetative elements are major features that enable the external part of the building exist in a natural form. Furthermore, the feeling of being drawn to nature is a main concern as it is a dwelling place (this is a psychological need for the inhabitants) apart from it physiological comfort such as good air content, regulated temperature and diffused natural light. These are parts of performance of landscape areas to meet human satisfaction.

In public areas such as shopping centres, organic elements are limited to much more durable ones. Vegetative materials used include trees strategically planted and arranged to neutralize harsh effect of climate and solar radiation on its building exterior and indirectly shielding the building interior space, while it does not impede pedestrian movements at building exterior. The main reason why vegetative element especially shrubs and grasses are minimized is because of the extended public activities in public areas that do not give room for delicate frequent maintenance work.

Hard and non living elements

For most part of public areas like commercial centres, functionality defines the extent of landscape design. Most places are paved because of the large and complicated patterns of pedestrians and vehicular movement. Man-made features are common elements use in the design approach to meet functional requirement. Furthermore, to ensure climatic consideration artificial element are blended with natural element.

Artificial elements are used to co-ordinate movement in and around the public facilities as also aids natural landscape element (such as water body swimming pool, fountain, kerbs works for tree plants). These are limited but maximized to control the micro-climate through green design approach. By extension the building interior space is positively affected through the type of materials that enclose the building spaces and various openings in the building that is relating to the exterior environment around the building.

Benefits of Landscape in Circulation Spaces in Shopping Centres

I. **Environmental Benefit** - Ecological conservation of endangered species. The pavement patterns of hard element help to co-ordinate and define the movement pattern for both pedestrian and vehicular circulation. The paved areas include sit out corridors, walkways, driveways and car parks. Vegetative areas are also demarcated from human encroachment by kerbs, crash bars and other artificial features. When human activities are co-ordinated by an extensive landscape design within the shopping form, delicate environmental benefits are conserved.

II. **Heat Mitigation -** Aside the roles which plants play in the regulation of solar radiation (achieve through shading tree and photosynthetic process in plants generally) , artificial water body such as fountain help regulated heat transfer. While artificial shading devices are majorly on the building envelop of a shopping mall.

III. **Air Quality -** with the presence of vegetative feature, there is readily available means for exchange of air (carbondioxide and oxygen) between human pedestrian and plants thereby considerably reducing air considered toxic to human health and increasing oxygen content in the atmosphere.

IV. **Psychological Benefit -** Landscape architecture aims at recreating the natural setting of the environment through the enhancement of the landform surrounding the shopping centre and the blending of building interior, exterior with natural landscape element. Human comfort is achieved when pedestrians feel a sense of ease with an eco-friendly environment brought by unifying nature with their activities.

V. **Aesthetic Value -** Landscape design also aim at unifying the various landscape features including the building structure with the natural landform to express a style

and aesthetic appeal through architectural principles and as well taking various functions of the shopping centre into consideration.

RESEARCH METHOD

The research adopted a post occupancy evaluation method as it gives building users and occupants the avenue to provide valuable feedback on the design quality, functionality and comfort. Post-occupancy evaluation (POE) is a platform for the systematic study of buildings once occupied, so that lessons may be learned that will improve their current conditions and guide the design of future buildings (Isaac et al 2009). An observation schedule was structured to evaluate the landscape elements available in the circulation spaces of the shopping centres alongside with questionnaires to rate the level of integration of landscape elements acceptance by the users. This assessment was conducted in Ilorin, Kwara State, Nigeria due to increased growth of shopping centres. Observations show that there are seventy-four (74) shopping centres in Ilorin, Kwara State. The shopping centres that was built in the last 7years (2010-2017) are thirty-three (33) which is 45 percent. Random techniques was used and ten (10) out of the thirty-three (33) built between (2010-2017) were selected. Three hundred (300) copies of questionnaires were administered with one hundred and fifty-six (156) copies returned giving a 52% return rate.

The data was collected and analysed, using descriptive statistics tools with the results presented in tables and charts. Pictures of some selected circulation spaces are presented as plates to explain further the issues within the discussion of results. Table 1.0 shows the ten selected shopping centre in Ilorin, Kwara State, Nigeria.

Table 1.0: Shopping Centre Studied

Name of Shopping Centre
Blessed Shopping Plaza
Crystal Palace
Debb Ega Shopping Mall
Favvicsam Mall
Gbose Mall
Harmony Hub
Hephzibah Plaza
Mamtess Shopping Mall
Palms Shopping Mall
Peculiar Grace Shopping Complex

RESULTS AND DISCUSSION

The results obtained through observation schedule were recorded using the representation below.

0 - Not available

1 - Available.

The result in table 2.0 shows that none of the shopping centres has trees which would have aided the solar shading and reduced energy consumption, thus it does not support economically sustainability. It also shows that 40% of these circulation spaces has shrubs and planters which enhance the focalization within the circulation space. Furthermore, shows that 30% had lawn which support social development but none had fountain or water bodies with its circulation spaces.

Table 2.0: Landscape elements at circulation spaces of shopping centres

S/No	Name of Shopping Centre	Landscape Elements					Total
		Lawn	Shrubs	Trees	Planters	Fountains	
1	Blessed Shopping Plaza	0	0	0	0	0	0%
2	Crystal Palace	1	1	0	1	0	60%
3	Debb Ega Shopping Mall	0	1	0	1	0	40%
4	Favvicsam Mall	0	0	0	0	0	0%
5	Gbose Mall	1	1	0	1	0	60%
6	Harmony Hub	0	0	0	0	0	0%
7	Hephzibah Plaza	0	0	0	0	0	0%
8	Mamtess Shopping Mall	0	0	0	0	0	0%
9	Palms Shopping Mall	1	1	0	1	0	60%
10	Peculiar Grace Shopping Complex	0	0	0	0	0	0%
	Total	30%	40%	0%	40%	0%	

In table 3.0, there are similarities in results with regards to landscape design principles. The result showed 30% of the circulation spaces considered had unity, balance and rhythm. Although balance and rhythm works simultaneously which has also be proven in the result shown. They can only give the required satisfaction if they are well unified. It also shows that 10% of the circulation spaces had balance considered, this support emotional sustainability within the space. Further analysis showed 40% of the circulation spaces are focused in the movement pattern, thus saving the users time and increasing shopping experience.

Table 3.0: Landscape design principles for circulation space

S/ No	Name of Shopping Centre	Design Principles					Total
		Unity	Balance	Proportionality	Focalization	Rhythm	
1	Blessed Shopping Plaza	0	0	0	0	0	0%
2	Crystal Palace	1	0	1	1	1	80%
3	Debb Ega Shopping Mall	0	0	0	1	0	20%
4	Favvicsam Mall	0	0	0	0	0	0%
5	Gbose Mall	1	0	1	1	1	80%
6	Harmony Hub	0	0	0	0	0	0%
7	Hephzibah Plaza	0	0	0	0	0	0%
8	Mamtess Shopping Mall	0	0	0	0	0	0%
9	Palms Shopping Mall	1	1	1	1	1	100 %
10	Peculiar Grace Shopping Complex	0	0	0	0	0	0%
	Total	30%	10%	30%	40%	30%	

Likert scale measurement discussed the shoppers perception to the integration of landscape elements in circulation spaces in shopping centres. Scoring scale of 1-4 was apportioned to the different options for choice for the respondents based on their perception of the variable being measured. The scoring of the options are stated below;

Very Dissatisfied 1

Dissatisfied 2

Satisfied 3

Very Satisfied 4

Table 4.0 shows that majority of the respondents are spread within the satisfied and dissatisfied section of the scale of measurement. The number of respondents in each section is multiplied by the weighted score allocated to it, the calculation for this is shown in table 5.0 and the total score across the rows are added up and presented as the total at the end of the table.

Table 4.0: Number of respondents per opinion on Satisfaction landscape principles with circulation spaces in shopping centres

Measured Variable	**Very Dissatisfied (X1)**	**Dissatisfied (X2)**	**Satisfied (X3)**	**Very Satisfied (X4)**	**Total**
Rating of Landscape Unity	31	52	58	15	156
Rating of Landscape Rhythm	27	90	23	14	154
Rating of Circulation against Landscape Focalization	8	71	60	17	156
Rating of placement of Plantings	6	20	119	11	156
Rating of Landscape Proportionality	40	52	50	10	152
Rating of Shoppers Attraction to Landscape	40	64	35	6	145
Rating of Relaxation within Circulation Spaces	62	50	25	15	152
Rating of shrubs with circulation spaces in shopping Centre	72	54	22	8	156

Source**:** Author's fieldwork, 2017

Table 5.0: Sum of respondents' responses on Satisfaction on landscape principles with circulation spaces in shopping centres

Measured Variable	Very Dissatisfied (X1)	Dissatisfied (X2)	Satisfied (X3)	Very Satisfied (X4)	Total
Rating of Landscape Unity	31	104	174	60	369
Rating of Landscape Rhythm	27	180	69	56	332
Rating of Circulation against Landscape Focalization	8	142	180	68	398
Rating of placement of Plantings	6	40	357	44	447
Rating of Landscape Proportionality	40	104	150	40	334
Rating of Shoppers Attraction to Landscape	40	128	105	24	297
Rating of Relaxation within Circulation Spaces	62	100	75	60	297
Rating of shrubs with circulation spaces in shopping Centre	72	180	66	32	350

Source**:** Author's fieldwork, 2017

The interpretation of the results obtained based on the Likert scale calculation is based on the range of scale stated as follows:

1.0	-	1.49	Very Dissatisfied
1.5	-	2.49	Dissatisfied
2.5	-	3.49	Satisfied
	>	3.5	Very Satisfied

Table 6.0: Respondents' opinion on Satisfaction with circulation spaces and landscape Principles interpretation

Measured Variable	Sum	Mean	Interpretation
Rating of Landscape Unity	369	2.37	Dissatisfied
Rating of Landscape Rhythm	332	2.16	Dissatisfied
Rating of Circulation against Landscape Focalization	398	2.55	Satisfied
Rating of placement of Plantings	447	2.87	Satisfied
Rating of Landscape Proportionality	334	2.20	Dissatisfied
Rating of Shoppers Attraction to Landscape	297	2.05	Dissatisfied
Rating of Relaxation within Circulation Spaces	297	1.95	Dissatisfied
Rating of shrubs with circulation spaces in shopping Centre	350	2.24	Dissatisfied

Source**:** Author's fieldwork, 2017

It can be observed from table 6.0 that majority of the respondents are dissatisfied with the landscape design employed in the circulation spaces of shopping centre judging by the design principles. Focalization as a principle of landscape design has been considered satisfactory by the respondents. These was due to the fact that the placement of plantings has helped shoppers and users of circulation spaces, move in particular direction hence guiding their movement with focus into the different shopping units.

CONCLUSION

The need to integrate green design in circulation spaces of shopping centres in Kwara State is quite high. The architects/designers of these shopping centres should consider the green design in shopping centres, however the management of these centres should incorporate good maintenance culture of landscape design. These are critical points of attraction in most shopping centres and building at large. During the course of the research, shoppers and users of these centres considered landscape design in circulation spaces not just adding aesthetic value but can also be a means of wayfinding, if the focalization of such landscape is well articulated. For proper integration of green design: Architects, Designers and Management should begin to consider landscape design principles and vegetative elements combined using the artistic and scientific approach. This is a good option for existing shopping centres to examine to allow users increase their level of satisfaction and acceptance of these centres, thus reducing demand for newer centre on the account of dissatisfaction of current one. In conclusion, it is apparent that any user or shopper not satisfied with his or her shopping experience would most likely not patronize such centres which in turn affect the sustenance of the establishment. It is therefore recommended that users and shoppers be allowed to have a feel of landscape design in the circulation space has against restricting it to the perimeter

of the building. It is important to also consider the selection of vegetative elements, its placement, harmony and other design principles.

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ASSESSMENT OF DISPLAY TECHNIQUES DESIGN CONSIDERATION FOR CAR SALES AND SERVICE STATION ABUJA

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Retail giants in every other industry have extensively used sophisticated display techniques but they have been grossly underutilized in the automobile sales and service stations. However, the display techniques must capture the emotion and perception of customers and also enhance patronage. Therefore, this study aims to identify the roles of display techniques in car sales and service station as stimuli that attract customers at the point of sale. The research method adopted for this study is the descriptive survey method by collecting quantitative data through the use of questionnaires and qualitative data through observation and case study survey. The results were analyzed and are presented in tables and charts while the pictures are presented in plates. The study reveals that it is possible to achieve a design exhibiting display techniques in automobile stations using visual merchandizing design variables. The study concluded that determining the aspects of the building where the architect can use the specific display technique designs to enhance high customers' patronage.

Keywords: Assessment, Automobile, Display, Merchandizing, Patronage.

INTRODUCTION

Abuja the capital city of Nigeria is one of the fastest growing cities in Africa; this has led to continuous influx of people from every part of the country into the city. One area that has been affected by this growth in population is transportation. There is an increased pressure on the available commercial vehicles conveying people from one place to another within the city (Kotler and Armstrong, 2010).

Especially in the mornings when virtually everyone is expected to go to work. People are constrained to queuing up waiting for commercial buses to transport them to and from their places of work. Most residents now consider the idea of possessing their personal cars more appropriate and convenient. Consequently, there is an alarming increase in the number of private cars within the city with a corresponding demand for facilities to serve the car and the owner. Consumer purchasing behavior is the buying behavior of the final customers who purchase goods and services for personal Usage. (Kotler and Armstrong, 2010). Kotler and Armstrong (2010) indicate that customers were influenced by marketing stimuli which are product, price, place and promotion as well as other stimuli in the customer's environment such as economic, technological, political and cultural. The car showroom is relatively close to place, one of marketing stimuli that stimulates customers purchasing behavior. Many potential customers visit the dealer in the early purchasing process, not just at the end of it. Therefore, this study aims to identify the roles of merchandising inside a car showroom as stimuli that attract customers at the point of sale i.e. the car dealership. Merchandising itself refers to all of the physical elements that merchandisers use to project an image to customers (Marketing Essentials, 2012). A study conducted by Foresight Research reveals that customers are won at the showroom; hence creating positive experience is the job of every automotive marketer and dealer (Foresight Research; Research Reveals, 2010).

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Sophisticated merchandising techniques, which are used extensively by retail giants in every other industry, have been grossly underutilized in the auto industry (Foresight Research, 2010). Based on an informal interview with the car dealer, the practices used in creating showroom environment rely on the creativity of each dealer although all props are provided by car producers. Apparently, there is no specific guidance or blueprint from the car makers and marketers on how to implement merchandising in the dealership. Therefore, it is plausible that car dealers will create showroom environment according to their own taste and preference. Some will rely more on selling techniques and seasonal promotion to win customer. Additionally, some dealers believed that showroom purposes are just for displaying new car models. These practices are contradicted with previous research did by Foresight Research (2010) which found that there is strong relation between merchandising and car purchase. Previous findings proved that purchase decision can be influence by consumer perceptions of trustworthiness and professionalism which can be stimulated by changing the dealership environment through carefully planned visual merchandising. Therefore, the problem analyzed is the role of merchandising in influencing car purchase at the point of sale i.e. the car dealership.

The Elements of Merchandising

Merchandising is the presentation of merchandise at its best; color coordinated, accessorized, and self-explanatory (Pegler, 2006). The focus of merchandising is on the presentation of goods in retailers (Taskiran, 2012). Four known elements of merchandising comprise of Show room front, showroom layout, Showroom interior and interior displays (Marketing Essentials, 2012). The table below detailed the elements of merchandising as adopted from Marketing Essentials (2012) leadership.

Table 1.0 The Elements of Merchandising Adopted in Marketing Essentials (2012).

Elements of Merchandising	Descriptions
Show room front	Refers to the exterior of a business that includes a store's sign or logo, marquee, outdoor lighting, banners, planters, awnings, windows, the exterior design, ambiance, landscaping, and lighting of the building.
Show room layout	Refers to ways that stores use floor space to facilitate and promote sales and serve customers.
Show room interior	Materials or tools used inside the store such as mannequins, seating, props, floor and wall covering, lighting, color, store fixtures, interior signage and graphics.
Interior display	Comprises of closed, open, architectural, point of purchase displays and decorations.

Merchandising Elements in a Car Showroom

When concerning car showroom, first elements that lure prospects inside are the showroom front. This starts with accessibility to parking that is convenient to entrance, attractive building exterior and landscape, and hearing music from the showroom (Darlington, 2007). Once prospects enter, they will look left, right and straight back (Darlington, 2007). Darlington (2007) suggested the showroom should have an area called a "decompression zone" that feels warm, relaxing and comfortable with music and aromas situated near the front door with no product in it. In terms of layout and display configuration, the layout of the showroom should facilitate easy access for visitors whereby majority of dealers favor a U-shaped setup (Carter, 2002). This allows for easy viewing of all displays and encourages customer to go through all the displays. In addition, the displays should be at 45-degree angle to the front door to allow customer to see more than one display at a time (Carter, 2002). Darlington (2007) listed several type of layout which includes grid layout with linear design, free flow layout, loop layout, soft aisle layout, combination floor plan layout and walls as destinations. Currently, most probably used by car showroom is free flow layout or combination floor plan layout.

For store interior, according to Taskiran (2012), lighting creates an ambience and makes environments visually pleasing. Additionally, lighting has an influence on the mood and hence the behavior of humans in retail environment (Quartier & Cleempoel, 2008). Similarly, color can immediately create a mood and have the power to pull customers into the store. Moreover, visual displays also have been utilized in car showroom recently. For instance, BMW car dealership uses touch screen visual display to attract visitors.

Building Envelope

These are various geometrical forms a building can portray to make it outstanding and attractive at the same time. The use of geometry (Shapes, freeform curves, and symmetry) to influence a building form, is in important in display design. The building geometry should be concise and also have a sense of symmetry in order not to hinder visual aid.

Natural landform features such as the terrain, plains, water body, which can influence the building geometrical form on ground various attractive ways also add appealing and aesthetical value in display design. This should also be considered as a key feature when choosing a location for such a building, harmonizing a building with its terrain and plains brings forth much attraction to the building.

Flooring

The common flooring materials such as terrazzo (marble, granite, wood, stone) or vitrified clay tiles should be chosen that they match the scheme and theme of the showroom. Materials can be used in combination with one another so as to bring about contrast.

Walls

There are many types of wall coverings, these include wood paneling, fabric, stone, mirrors, tiles, rough boards and bricks. Paints coverings such as wallpapers can be use in an attractive way to match the scheme and theme of the showroom which can bring about textures and various effect in colour.

Ceiling

In showrooms with height, the treatment given to ceilings is very vital in portraying display and as such all the treatments and claddings for walls can be provided to the ceiling as well. When used innovatively, they can produce striking results, steel beams can incorporate different unique patterns and perforations which can make a huge difference.

Siting and Orientation of Building

In display designs, Siting of the building is very vital as well as orienting the building. The building should be sited alongside with the orientation been put into consideration because they work hand in hand. Siting should be along a major access road for ease of accessibility and also to enhance thereby orienting the façade of the showroom as well as the main entrance of the building facing the access road to aid visualization towards the displayed cars without any form of obstruction.

RESEARCH METHOD

This research employed the descriptive survey methods of conducting and analyzing research using observation schedules and personal interview to obtain data. The observation schedules were used in obtaining data on the display techniques used in automobile buildings and the level of application of the components and the design principles of display technique architecture. The data derived from the survey were collated and analyzed using SPSS and the results were presented in charts and tables.

Abuja which is the capital city of Nigeria is chosen as the study area for this research because it’s one of the fastest growing cities in Africa and as such has led to continuous influx of people from every part of the country into the city. One area that has grossly been affected by this growth in population is transportation. Due to this constant immigration of people from other place into Abuja city, there is need to situate a proper Automobile sales and service stations within the city that will make available to the public a station where new models can be displayed and sold, serviced and repaired as well.

Table 2.0: Automobile Stations studied

S/N	Name of Automobile Stations
1	Coscharis Motors
2	Auto Plaza
3	ASD Motors
4	Audi Motor
5	Alubarka Automobile
6	Fortune Motors
7	Briscoe Motors

Source: Authors' fieldwork, 2017

RESULTS AND DISCUSSION

The results derived from observations during the survey from the studied automobile stations shows that most of the studied automobiles stations lack the use of merchandizing techniques design approach which plays a vital role in achieving a marketing environment for this products. During the course of the research, it was observed that most of the automobile stations didn't incorporate the use of these various merchandizing techniques design features and principles which is a key element to be considered in this research due to the peculiar nature of the building.

Building Envelope Form

Most of the Automobile station surveyed did not inculcate the use of geometrical forms. incorporating the use of building envelope form that has to do with the geometry of the building in terms of the shape and sizes of openings of the windows and the roofing structure as well as an interesting façade, these building envelope components contributes to the aesthetics as well as the bringing forth high attraction rate which will enhance the products patronage. However, a small number of them employed the use geometry in their buildings. Fig 1.0 shows the degree of percentage of usage in automobile stations.

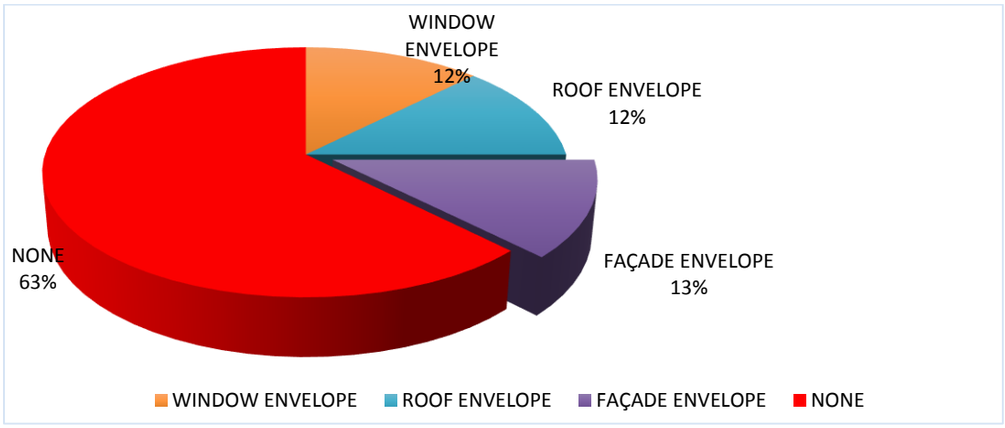

Fig 1.0: Percentage of building envelope form employed in surveyed automobile stations.
Source: Authors' fieldwork, 2017

Landscaping and Natural Features

Majority of the Automobile stations didn't incorporate the proper use of both hard and soft landscaping elements and these landscaping elements plays a vital role in the display techniques design as they portray the aesthetical value of the surrounding and the building itself. Most are located within the city Centre and far from natural environmental features such as mountains, water bodies, plains and natural vegetation. In view of that, the fact that the automobile stations are situated away from these natural features means the geometry of the building cannot be influenced by plains or terrain which in additions which contributes to the beauty of the structure and also brings forth much attraction towards its products.

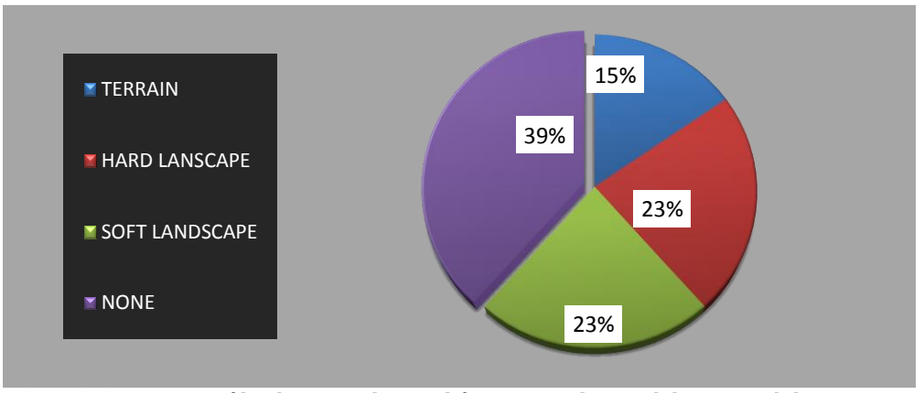

Fig 2.0: Percentage of landscape and natural features used around the automobile stations.
Source: Authors' fieldwork, 2017.

Materials and Finishes

Most of the Automobile stations considered made use of artificial construction materials that enhances visibility for passersby. However, a good number of them employed the use of other auxiliary building materials and finishes without ornamentations in other not to hinder visibility from afar. Fig 3.0 shows the degree to which these materials were used in the automobile stations.

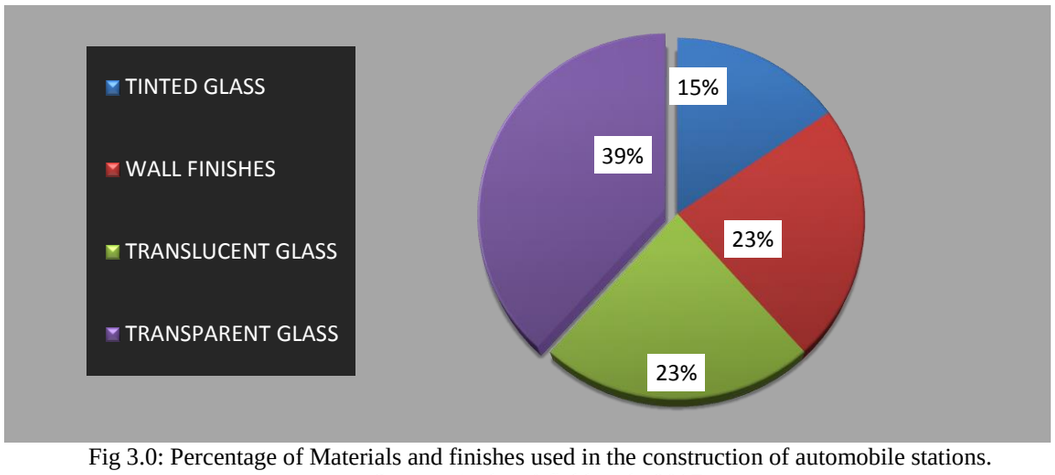

Fig 3.0: Percentage of Materials and finishes used in the construction of automobile stations.
Source: Authors' fieldwork, 2017.

Siting and Orientation of Building

Siting and orientating the building plays a very vital role in display techniques design, it should be considered firstly before other display techniques variables are been put in place. Most of the Surveyed Automobile stations situated their buildings along the road side because it aids accessibility and paves way for higher chances for this products to be viewed and also purchased. However, a good number of these stations oriented their building with the entrance façade facing the south which points to major access road thereby providing room for outsiders or passersby to access this product visually from a distance.

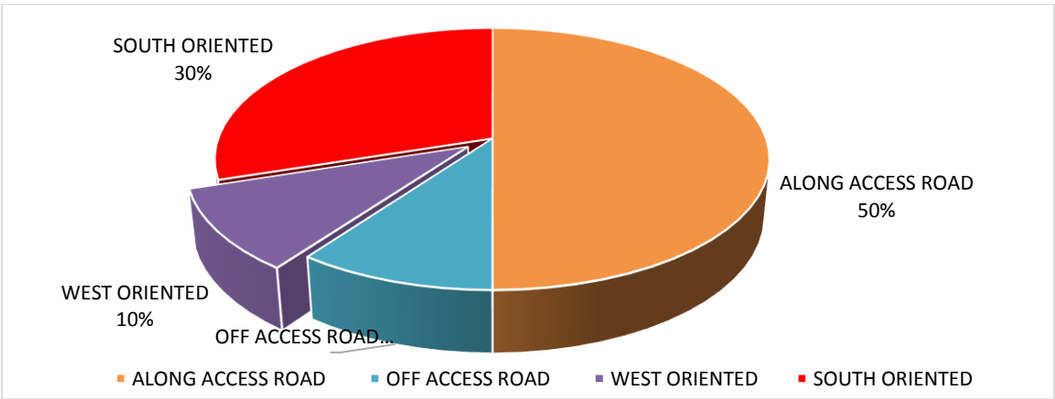

Fig 4.0: Percentage showing building siting and orientation.
Source: Authors' fieldwork, 2017.

CONCLUSION

In Abuja, this merchandizing design ideology has not been effectively adopted in the design of automobile stations. During the course of the research, it was observed that only three of the surveyed automobiles stations adopted the use of geometrical envelope form as one of the merchandizing display design technique meanwhile no challenges were faced with this particular technique while emphasis was not given to other various merchandizing ideology. Merchandizing design approach brings about attraction and also promotes higher sales of this displayed products and as such the incorporation of these various techniques needs to be effectively applied at the design stage to bring in customer's friendliness and also encourage their will to patronize the products thereby promoting higher sales. Professionals in the building industry should adopt the concept of merchandizing in their designs and construction. It is a reliable step towards marketing of the products.

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ASSESSMENT OF PASSIVE CROWD DESIGN CONTROL CONSIDERATIONS IN JUMUAT MASJIDS (MOSQUES), MINNA, NIGER STATE

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Gradually, the population of Nigeria cities is increasing, this increase in populations are products of rural urban migration, the Jumuat prayer is a weekly Eid prayer for the Muslims and are performed only at Jumuat Masjids every Fridays of the week at Noon. It is expected that all congregations are aligned facing the direction of the qibla. The congregation use to be so many that the praying areas provided are not well utilized. This leads to poor arrangements of congregation on the outdoor praying areas. Provision of a conducive space for the congregation during worship has become more challenging especially the outdoor praying areas, this result to congestion on roads and causing stress on roads. Ensuring convenient exit has also become challenging during and when the prayer is over, especially at the time of emergency situation such as terrorist attack when there is need to evacuate large crowd from the mosque. In every location, there is a Jumuat mosque in Minna city along the major access road is a road block or holdup during the time of prayers. This research seeks to provide means of enhancing crowd movement within and around the mosque environment, critical issue of congestion within and around the mosque environment was addressed, crowd flow, crowd management and control was addressed, the potential use of passive crowd control design elements in the design of Jumuat mosque to improve the control and management of crowd in Jumuat mosque are highlighted. Mixed method research method was adopted using observation schedules and a questionnaire. SPSS was used to analyse the quantitative data. The result will reveal that absence of passive crowd control elements contribute to stress and congestion cause by congregations during jumaut prayers. The result show that congregations were not satisfied with the outdoor praying areas of most Jumuat Masjids. The report also show that passive crowd control design elements will improve congregations praying conditions during Jumuat Prayers.

Keywords: *Jumuat Mosque, Praying Area, crowd Management, crowd control.*

INTRODUCTION

Architecturally, mosques are facilities that are unique in the sense that it is the only structure in which the space is occupied by floor-seated individuals (Nassar, Bayyoumi 2012). The prayer hall is usually the highest of occupant capacity of the mosque and yet the International Building Code IBC has not yet specify load factor that will be appropriate for prayer hall of a mosque More importantly, the requirements for passive crowd control design elements, access for individual who need to perform ablution from praying hall offer unique challenges especially when the mosque is already filled up with congregation. Most building do not have specification for passive crowd control elements. The problem is intensified in the case of mosque prayer hall designs and in confined large facilities area like airports and shopping malls, where limitations exist on the location and design of the means of passive crowd control, unlike open mosque In addition to the passive crowd control and life safety concerns, very limited works have been done on the level of expected service in facilities of the mosque in general most especially at corridors or access. This often results in inefficient flow of congregation into and out of the mosques which places huge risks on the worshipers' life in case of disasters. Many distinctive issues affect passive crowd control requirements for mosques during Friday prayers like where many loads of occupants are expected.

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For instance, when putting into consideration design standards and passive crowd control requirements for mosques, the irregular behaviour of the congregation before and after the prayers (because of social exchanges) should be put into account and also other functional reasons like the need to wear shoes after coming out of the prayer hall immediately, which cause temporal blockage of exist. Hence, the temporal and spatial behaviour of the congregation should be put into consideration when putting up design standards for mosques. In addition, many questions remain open regarding design of Mosque; which of the exit is better, side or back? Square and rectangular configuration, which is better? How comfortable are the outdoor congregation? Where best should ablution area be located?

The condition of indoor and outdoor praying areas of Jumuat Mosques are very important for the congregation to enable them have a concentrative prayer session. There is, therefore, the need to make it conducive for the congregation. This can only be achieved through design by allowing the information collated from the congregation to be used in the design. Passive crowd control design elements are important in the design of the mosques because a prayer session need no physiological disturbances. The present design of mosque mostly causes crowd scattered around the mosque which causes tension on roads to passer bye. Hence there is need to examine the cause and possible solution.

The Study Area

The research work was conducted within Minna, the state capital of Niger state. The state capital comprises of two (2) local Government Areas, Chanchaga Local Government and Bosso Local Government. Geographically, Niger state is the largest state of out of the thirty six (36) state in Nigeria with it coordinate as latitude 3.20^{o} East and longitude 11.30^{o} North. The state is bounded by Kaduna on the south east and Abuja on south west, the state is bounded with Zamfara state on the north, by Kogi state from the south and by Kebbi on the western part.

According to 2006 census, the population of the state is three million, nine hundred and fifty thousand, two hundred and forty nine. (3,950,249). The three major ethnic groups in the state are Nupe, Bgagy and Hausa. Other ethnic groups include: the Koro, Kambari, Kamuku, Pangu, Bassa, Bauchi, Fulani, Dukawa, Gade, Dogara, Ganagana, Mauchi, Ayadi, Ingwai, Dibo, Kakanda, Gulengi, Abishawa, and Shigini.

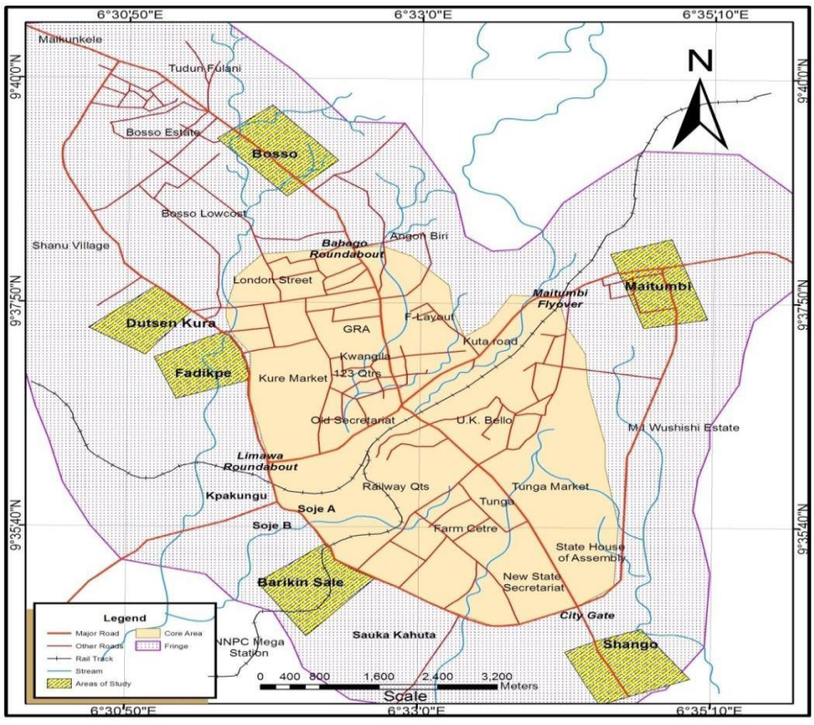


Fig. 1 Map showing Minna Streets, Niger State.
Source: Adopted from (Abdullahi, Adedayo 2017)

Crowd Management

Crowd management deals with effective organizing of crowd movement. A crowd is define as collection of large number of people in compact body without order (Merriam- Webster's Collegiate Dictionary, 1993) Understanding basic of crowd behaviour help an event managers in conveying effective plans. It is important to understand that crowd differ from

each other. Crowds can trigger violent behaviour, which can result to destruction of property, injury, and, in some cases it can cause loss of life (Abbott, Geddie 2001)

Crowd management plans should be designed to meet the event requirement and expected crowd. When planning for crowd, certain key matters need to be put into consideration, the sociological behaviour of the people, seating arrangements, circulation, time, parking area, condition of the weather, demographics, size and concession stands (Berlonghi, 1994). In the case of seating arrangements, for example, seating capacity must be put into consideration, assembling the seating, and seating location. Unassigned seating area should be clearly specified. Assigned seating area should be well organised.

Crowd Control

Having discovered how effective crowd management can be achieved, it is also important to assess the factors that involve in achieving a successful crowd control plan. As stated previously, crowd control is a procedure and steps which should be followed in case the crowd lost control. The technique involves creating conditions, models, and process of decision-making to achieve a successful directional flow of equipment under a command which is unified (Alghamdi, 1993). To achieve a successful crowd control plan, it involves procedures which are implemented at certain stages of an event. The event manager must put into consideration the preventive or prevent measures that may reduce the necessity for emergency strategies at the event. According to Janowski (1996), to achieve a successful crowd control plan, statement of purpose should be included first which should focus on the plan and provide for the goal of the crowd control. He states that the goal can be "to provide for all the visitors, participants, and support personnel with an environment which is safe and secure to enjoy the activity. It is at the stage that the event manager tries to understand the risk and problem of crowding, such as violence, panic, injury, and finally liability. Again, an event manager should be able to know what causes violence. A crowd can become violent if it observes security using extreme force in its reaction to a certain condition (Berlonghi, 1994). In this regard, crowd control problems can first be precipitated through action and reactions domino effect.

RESEARCH METHOD

The method of the research adopted for this study was descriptive method applying a Post Occupancy Evaluation approach. The study area is Minna, capital city of Niger State. It has two local government, Bosso and Chanchaga Local Government. These areas were examined, Minna town have total number of 22 recognised Jumuat Mosques according to Ministry of religious affairs, Niger state. Ten mosque were purposively selected based on population, the selection was based on population of congregation during the Jumuat prayer. A check list was designed based on literature to obtain information on the facilities for passive crowd control design elements in Jumuat Mosques and their functional requirements. The check list covers facilities such as adequate door width, adequate door number, define parking spaces, circulation path ways, signage, markings on the floor, shading of outdoor praying area. Functional requirements of the facilities were also drawn up for the purpose of the study. A total of 10 Jumuat Mosques were observed. The Jumuat Mosques were categorize into 3 zones and the research assistant were then allocated to various categorized zones. A questionnaire was developed and administered to the selected 20 respondents from four Jumuat Mosque out of a study population of 10 Jumuat Mosque putting into consideration the capacity of the Mosque. 100 copies questionnaire was administered with all of them returned. The selection of respondents within the Jumuat Mosque was done between the chief Imams, Mosque committee members and the Mamus (congregation) using a Stratified Random sampling method how?. Four research assistants were distributed amongst the four selected Jumuat Mosque to determine user's perception on passive crowd control design elements in existing Jumuat Mosques. The data were obtained from the survey. SPSS software was use to analyse the quantitative data using descriptive tools such as cross-tabulation and frequency. The result was transferred to Microsoft Excel software which was used to generate charts and tables Cameras were used for visual observation and the results are presented as plates to improvise some explanation made on the tables.

Table 1: List of Studied Jumuat Mosque in Minna, Niger State

S/N	Name of Jumuat Mosque
1	Central mosque, Minna.
2	Oduoye Jumuat Mosque.
3	Secreteriate Jumuat Mosque.
4	Tunga Jumuat Mosque.
5	Bay clinic Road Jumuat Mosque.
6	Niteco Road Jumuat Mosque
7	Tayi Village Jumuat Mosque.
8	Dutsen Kura Gwari Jumuat Mosque
9	M.I. Wushishi Estate Jumuat Mosque.
10	Futminna Jumuat mosque

Source: Authors' fieldwork, 2017

Table 2: Observation Schedules of Selected Jumuat Mosques Measured Against Design Requirements for the Physically Challenged.

Jumuat Mosque	Adequate Door Width	Adequate Door Number	Defined Parking area	Circulation Pathways	Signage	Marking on the Floor	Shading of Outdoor praying Area
Central mosque, Minna.	V	X	V	X	X	X	X
Oduoye Jumuat Mosque	V	X	X	X	X	X	V
Secreteriate Jumuat Mosque	V	X	X	X	X	X	X
Tunga Jumuat Mosque	V	V	X	X	X	X	X
Bay clinic Road Jumuat Mosque	X	X	X	X	X	X	X
Niteco Road Jumuat Mosque	V	V	X	X	X	X	X
Tayi Village Jumuat Mosque	X	X	X	X	X	X	X
Bosso Estate Jumuat Mosque	V	X	X	X	X	X	X
Dutsen Kura Gwari Jumuat Mosque	V	X	X	X	X	X	X
M.I. Wushishi Estate Jumuat Mosque	V	X	V	X	X	X	X
TOTAL.	8	2	2	0	0	0	0

Source: Researchers fieldwork (2017)

FINDINGS AND DISCUSSIONS

The analysis of the data obtained through observation schedule was done and presented in tables and plates below. The mosques were zoned for less cumbersome data presentation and analysing passive crowd control design elements thereby seeking to address its adoption in mosques within Minna as a measure for crowd control.

The result presented in Table 3 shows that a majority of the mosques in Minna do not consider passive crowd control design elements. This gives rise to an area which the Architect and the mosques administrator need to introduce to mosque designs as it can help as a means of cforwd control. Passive crowd control design elements aside functioning as a tools for crowd control can also help in adding more aesthetics to mosque surroundings as seen in Plate 1 where Tunga Jumuat mosque have trees for shading outdoor praying areas. Elevated planters can also be used to direct movement of crowd and in some cases to have reinforced bollards within them, thereby hindering vehicular access. When reinforced and rightly placed, serve two purposes, providing both crowd control and an attractive landscape element.

Plate 1. Tunga Jumuat Mosque before Jumuat prayers
Source: researchers filed work (2017)

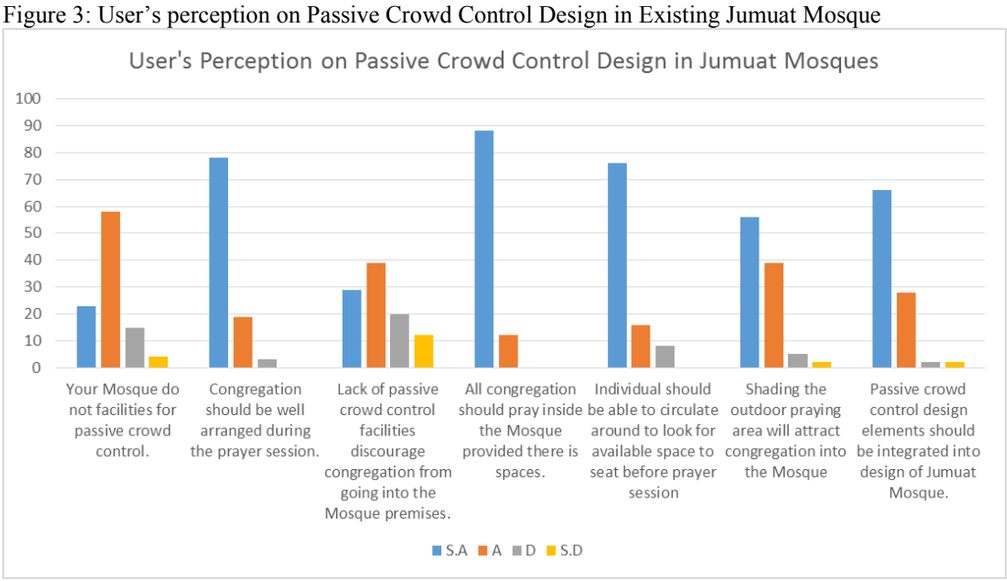
In determining the adequacy of the option for the variables the observation is tabularised in table 2. It could be observed that of the seven variables that related to passive crowd control measured, one of them was consider as adequate in meeting the demand to improve crowd control of mosque buildings using passive methods in designing. Two variables is inadequate while the remaining four variables are completely not provided. The implication of these findings is that architects involved in the design of mosque buildings could understand how to approach issues related to crowd control as it affects the movement of congregation and passer bye.

Table 3: Users Perceptions on Design Requirements for Passive Crowd Control Design Elements in Existing Jumuat Mosques.

Perception of Facilities for Passive Crowd Control Design Elements.	S.A	A	D	S.D
Your Mosque do not facilities for passive crowd control.	23	58	15	4
Congregation should be well arranged during the prayer session.	78	19	3	0
Lack of passive crowd control facilities discourage congregation from going into the Mosque premises.	29	39	20	12
All congregation should pray inside the Mosque provided there is spaces.	88	12	0	0
Individual should be able to circulate around to look for available space to seat before prayer session	76	16	8	0
Shading the outdoor praying area will attract congregation into the Mosque	56	39	5	2
Passive crowd control design elements should be integrated into design of Jumuat Mosque.	66	28	2	2

Source: Researcher's Field Work (2017)

Figure 3: User's perception on Passive Crowd Control Design in Existing Jumuat Mosque



Source: Researchers Field Work (2017)

Respondents' perception on the adequacy of passive crowd control in existing Jumuat mosque in minna confirms that they are inadequate. 60% of the respondent agreed that Jumuat mosque do not have facilities of passive crowd control, 20% strongly agreed, 15% disagree while 5% strongly disagree as shown in figure 3 above. The second statement which is congregation should be well arranged during prayer session, 80% which represent the highest number of the respondents strongly agree with the statement as shown in figure 3 above. 30% of the third statement represents the highest number of respondent that agrees that lack of lack of passive crowd control facilities discouraged congregation from going into the mosque to pray. 80% of respondents strongly agrees that all congregation should pray inside the mosque provided there is space. 75% of the respondents strongly agrees that congregation should be able to circulate around the mosque to look for available space to seat before prayers. 55% and 40% of the respondents respectively agrees and agrees that provision of shadings encourage congregation to go into the mosque premises to pray. And lastly the highest percentage of the respondents which is 65% strongly agrees and 30% agrees that passive crowd control design elements should be integrated in the design of Jumuat mosques.

CONCLUSION

This study has analysed through literature review that there is important need to integrate passive crowd design control in Jumuat Masjid. From the above findings, it can be concluded that most Jumuat Mosque in Minna do not have passive design control considerations. Passive design control goes beyond providing a large space for congregation. There is need to provide conducive environment for the congregation to avoid congregation spreading praying mats on the road to pray. It is the responsibility of the planning authorities to ensure that appropriate guidelines for controlling crowd through designs are employed in the design of Jumuat Mosque. It is also important for Architects and other building professionals to explore passive crowd control in the design of Jumuat Masjid. This is to reduce scattered crowded praying session which normally causes stress not just to congregation but to passer byes.

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ASSESSMENT OF PASSIVE SECURITY MEASURES IN SENATE BUILDINGS OF FEDERAL UNIVERSITIES IN NORTH CENTRAL NIGERIA

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Crime and terrorism are some of the greatest challenges facing Nigeria and the Government has been unsuccessful in providing a secure and safe environment for lives and properties. The rising issue of insecurity in Nigeria has resulted in high crime rate with educational facilities and public places being major targets. The aim of this research is to assess the passive security measures in senate buildings of federal universities in North Central Nigeria with the view of addressing the incessant security challenges in public buildings through passive means. Descriptive survey method was used to gather data for this research work, the data collection instruments used for the survey were observation schedule and interviews. A checklist was used to assess the passive security measures that were incorporated in the design of the senate buildings in the study area. The results obtained were analyzed using descriptive statistical tools such as mean, percentages and averages. The findings revealed that passive security measures incorporated in the senate buildings were more of reactive than proactive measures which were more like after-thoughts. The study thus recommends that passive security measures should be considered for the site layout and the building structure during the design phases of new construction and that Crime Prevention through Environmental Design (CPTED) can significantly reduce the fear of crime as well as the costs associated with hiring security personnel.

Key words: Access Control, Passive Security, Senate Buildings, Surveillance, Territoriality.

INTRODUCTION

Edem (2010) opined that security is the guarantee of the future wellbeing and freedom from threat. Security has become a vital issue in the design of public buildings in Nigeria due to the occurrences of terrorist threats in the nation. The issue of terrorism and violence has been discussed when it comes to religious and commercial buildings but recently there have been several cases of insecurity in institutions of learning ranging from terrorist attack, hostage taking of senior administrative heads or vandalism of buildings and other property. According to Mustapha (2017), thirty four (34) university lecturers were killed in the University of Maiduguri, Borno State and forty (40) others resigned due to the notorious activities of the dreaded Boko Haram Sect. Abiodun (2012), also reported that the Vice Chancellor of Adekunle Ajasin University, Akungba-Akoka (AAUA) in Ondo State and his management team were compelled to remain indoors in the senate building complex for several hours by protesting non-academic staff, Mohammed (2014), reported that several staff of the University of Obafemi Awolowo University (O.A.U) were held hostage in the senate building complex as a result of students protesting. All of these records go to show that the senate building in tertiary institutions are major targets of terrorist attack and other threats which have led to the mounting of active security checks and measures in and around these buildings to reduce the incidence and threat of crime. Though these measures have been useful in curbing crime to an extent, insecurity still thrives in the country thus giving rise to the need of complementing these active security measures with passive ones. The aim of this paper is to assess the passive security measures in senate buildings of Federal Universities in North Central Nigeria.

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Security Threats in Buildings

According to Challinger (2008), security threats in buildings can be grouped into five categories, they are:

- **Crimes:** Theft and burglary in particular from private spaces, car parks and delivery docks, property damage including graffiti and sabotage most likely in common areas and car parks.
- **Disorder:** Behavioural issues including drug dealing from the building, hostage-taking, trespassing, suicide risk, protests, and drunk or drug affected behaviour.
- **Emergencies:** Human caused or related crisis including fire, infrastructure and elevator failures, electricity blackouts, biochemical attacks, terrorist attacks, and natural disasters including severe weather events such as earthquakes, floods, tsunamis, hurricanes, tornados, and snowstorms.
- **Man- Portable Improvised Explosive Devices:** Man-Portable Improvised Explosive Devices (MPIEDs) are generally used to target people rather than structures, they tend to be significantly smaller than Vehicle – borne improvised explosive device (VBIEDs) and may be concealable in backpacks and suitcases allowing for ease of entry into a building. Victims of such attacks are often injured by shrapnel and projectiles, including fragments of scattered glass, rather than building collapse.
- **Vehicle- Borne Threat:** "A Vehicle –Borne Improvised Explosive Device (VBIED) has the capacity to hold enough explosive material to significantly damage or even destroy a building" Vehicle-borne threats range from vandalism to sophisticated or aggressive attack by determined criminals and terrorists. The payload capacity and mobility of a vehicle can offer a convenient delivery mechanism for a large explosive device. Hostile vehicles can be parked, manoeuvred or rammed into or out of a target location.

Active Security Measures in Buildings

Active security measures are measures that use proven systems and technologies designed to prevent, identify, report and respond to threats (Terrence, 2005). This is seen in the use of security personnel at check points, installation of surveillance system in public area and buildings and screening at entrances of public facilities. This measure is key in curbing insecurity challenges but is not sufficient considering that terrorism is a whole different level of insecurity in terms of the amount of casualties, loss of properties and the amount of attention drawn to it and also for the fact that with all the active measures put in place, insecurity still thrives in the country. For security to be effective there is a need to blend the active and passive security measures to complement each other.

Concept of Passive Security Measures in Buildings

The basic concept of passive security measures to address an explosive threat considers the establishment of a protected perimeter, the prevention of progressive collapse, the design of a debris mitigating façade, the seclusion of internal explosive threat that elude the detections through the screening stations or may enter the public space prior to screening and the protection of the emergency evacuation, rescue and recovery systems (Zineddin and Sherwood, 2008). Terrence (2005) opined that passive security measures are measures that involve the effective use of architecture, landscaping and lighting to attain improved security by deterring, upsetting, or mitigating possible threats.

Evolution of the Concept of Crime Prevention through Environmental Design (CPTED)

The use of crime prevention through environmental design (CPTED) ideas goes back a long way and CPTED-style security measures can be traced to early human settlements. These include the establishment of iron-age forts and castles, which used landscaping, walls, moats, and drawbridges to control access (Schneider and Kitchen 2002). Crime prevention through environmental design (CPTED) is a strategy used to provide protection to buildings and facilities and is based on the concept of deflecting crime and decreasing crime fear by thoughtful architecture and effective site design (Demkin, 2004; O'Shea and Awwad-afferty, 2009). The theory of CPTED has its roots in Newman's (1972) work and Tim Crowe's efforts (early 1990s) that integrated behavioral psychology and sociology of human behavior with architectural design (Demkin, 2004; Wenzel, 2007). Newman performed a study of

large-scale public facilities, that was developed further by the criminologist Jeffery (1971), who established principles of CPTED (Coaffee and O'Hare, 2008; O'Shea and Awwad - afferty, 2009; Bishop, 2004; Wenzel, 2007). According to Bishop (2004), CPTED as a method does not affect people negatively because it neither supports the use of conventional barriers, nor does it create a bunker-like environment. Coaffee and Bosher (2008) reveal that CPTED connects to essential aspects of construction and sustainability as it incorporates the use of environmental features to ensure buildings' security. The following principles of CPTED are suggested by the literature which includes:

1. **Territoriality:** Informing the public about the purpose, use and acceptable activities of the facility, so that facility spaces could be defined in territories by landscape features like level differences, pavement designs, shrubs, and low walls (Demkin, 2004; Wenzel, 2007; Bishop, 2004).
2. **Access control:** Prohibiting strangers from accessing sensitive areas by means of a gatehouse or other barriers (Demkin, 2004; Wenzel, 2007; Bishop, 2004).
3. **Surveillance:** Watching critical areas through natural views (provision of clear and unobstructed view), mechanical devices (using equipment like closed circuit cameras, motion detectors, and sensors), and operational devices (provision of security staff and personnel) (Demkin, 2004; Wenzel, 2007; Bishop, 2004).
4. **Management and maintenance of site:** Keeping the site and buildings clean and clear with up-to-date maintenance of the building, its envelope, and its component (Bishop, 2004).

Passive Security Measures

Security design strategies are the measures in which passive security design is incorporated into architecture. All passive security measures essentially incorporate CPTED concepts. Passive security measures are measures that involve the effective use of architecture, landscaping and lighting to achieve improved security by deterring, disrupting, or mitigating potential threats (Smith, 2012). Passive security measures include:

i. Providing efficient building setbacks, or standoff distances to create protective building perimeters and to restrict access to buildings.

ii. Provide effective building layout: Effective design of building layout and orientation can significantly reduce opportunities of intrusion.

iii. Installing barriers (for example bollards, reinforced planters, and site furnishings) to withstand assaults by moving vehicles.

iv. Locating parking areas in secluded areas and eliminating under-building parking areas to minimize blast effects from potential vehicle bomb which could lead to damage (Paradise, 2012).

v. The use of Landscape design.

Each strategy alone can be effective, but the best solution combines all.

Elements of Passive Security

Types of passive security elements include the following: Physical site characteristics, such as soft boundaries and transition zones, through creation of low height berms and gently graded slopes, can delineate public and private areas without fencing (Nadel, *et al.,* 2001)**.**

i. Passive bollards are vehicle security barriers with foundations of 300mm depth, foundations to be tied together. Spacing allows 1200mm clear maximum. It is capable of stopping a 15,000Ib vehicle at 30mph within 1,000mm of the non-impact side. Passive bollards can be used when perimeter security is a priority. Perimeter security is essential to prevent a moving or stationary vehicle bomb attack. Bollards are used to restrict vehicle traffic and access.

ii. Low screen walls with foundations and height of 900mm minimum is recommended. It can have openings not greater than 1,200mm clear.

iii. Reinforced planters with foundations 300mm below grade and Planters of 900mm high above grade are required for security protection.

iv. Water bodies, seating with foundations which must meet applicable design criteria and lessen identified threat criteria. Elements that fail or provide

insufficient response are considered vulnerabilities and need to be upgraded (Nadel, *et al.,* 2001).

External Areas

a. Perimeter Fencing

Perimeter fencing defines a legal boundary around a site, and should be located as close to boundaries as zoning or existing site constraints allow. Fencing creates a barrier against outside encroachment or intrusion, whether intentional or unintentional (Leskosky, 2009). A security fence serves the following functions:

i. Restricted area boundary definition: fences are used to define the outermost boundary of a restricted area to deter accidental or casual intruders from entering.

ii. Traffic control: fences are used to channel and control the flow of personnel and vehicles through designated entries into the site.

b. Parking Area

Building and property owners can enhance employee safety by reviewing parking lot locations and circulation routes between parking and workplace areas. Good lighting should be provided. A single vehicular access and egress point will minimize the likelihood of vandalism, theft, or muggings (Nadel, *et al.,* 2001). Design of parking lots and drop-off locations usually considers zoned parking areas, minimum standoff requirements, separation of visitors and others. Hierarchy of parking areas may include restricted areas for staff and trusted individuals closer to the facility, and more remote visitor lots. Internal roads should be designed for efficient circulation between site access points and should never breach standoff areas or pass over areas of critical infrastructure distribution (Nadel *et al.,* 2001).

RESEARCH METHOD

Descriptive Survey method with the use of observational schedule/ checklist was adopted; this involves the use of direct observation of the study area. An observation schedule was structured to assess the passive security measures considered in the senate buildings of the Federal Universities studied. The assessment was conducted in the six Federal Universities in the North Central Part of Nigeria and the Federal University in Federal Capital Territory (F.C.T.). The data was collected and analyzed using descriptive statistical tools as mean, percentages and averages in a tabular form. The seven Federal Universities studied are listed in Table 1.0

Table 1.0: Names of the Institutions selected in north central Nigeria

S/No.	Name of Institution
1.	University of Jos, Plateau State.
2.	Federal University Lafia, Nasarawa State.
3.	Federal University of Technology Minna, Niger State.
4.	Federal University Lokoja, Kogi State.
5.	University of Ilorin, Kwara State.
6.	University of Agriculture Makurdi, Benue State.
7.	University of Abuja, (F.C.T.).

FINDINGS AND DISCUSSION OF RESULTS

The results obtained through observation schedule were recorded using the following representations.

0- Not available
1- Available

The result in Table 2.0 shows that 71% of the Federal institutions studied did not provide perimeter fencing while only 29% provided perimeter fencing which is the first line of defence for any building property and properly defines the territory of that building.

Table 2.0: Presence of perimeter fencing

S/No.	Name of Institution	Available	Not available
1.	University of Jos, Plateau State.		0
2.	Federal University Lafia, Nasarawa State.		0
3.	Federal University of Technology Minna, Niger State.	1	
4.	Federal University Lokoja, Kogi State.		0
5.	University of Ilorin, Kwara State.	1	
6.	University of Agriculture Makurdi, Benue State.		0
7.	University of Abuja, (F.C.T.).		0
	Total	29%	71%

Plate I: The use of iron bars as perimeter fencing at the senate building of federal university technology Minna, Niger State.

Table 3.0 shows that 57% of the Federal Universities did not consider the use of plantings to control pedestrian and vehicular access while only 43% made considerations for the placement of plantings to control pedestrian and vehicular access to places people are permitted to reach and also restricting people from places they are not permitted to get to.

Table 3.0: The use of plantings to control pedestrian and vehicular access

S/No.	Name of Institution	Available	Not available
1.	University of Jos, Plateau State.		0
2.	Federal University Lafia, Nasarawa State.		0
3.	Federal University of Technology Minna, Niger State.	1	
4.	Federal University Lokoja, Kogi State.	1	
5.	University of Ilorin, Kwara State.	1	
6.	University of Agriculture Makurdi, Benue State.		0
7.	University of Abuja, (F.C.T.).		0
	Total	43%	57%

Table 4.0 shows that only 14% of the study area did not orient the building reception towards the influx of persons to the building while 86% oriented the building reception/entrance to enhance visibility which goes a long way to addressing the issue of natural surveillance as persons who approach the building entrance could be sighted from a good distance.

Table 4.0: The Orientation of Building reception towards high traffic

S/No.	Name of Institution	Considered	Not considered
1.	University of Jos, Plateau State.		0
2.	Federal University Lafia, Nasarawa State.	1	
3.	Federal University of Technology Minna, Niger State.	1	
4.	Federal University Lokoja, Kogi State.	1	

5.	University of Ilorin, Kwara State.	1	
6.	University of Agriculture Makurdi, Benue State.	1	
7.	University of Abuja, (F.C.T.).	1	
	Total	86%	14%

Table 5.0 shows that 100% of the Institutions in the study area all considered creating separate parking lots for senior staff of the senate building and visitors which helps to restrict access to the building with vehicles to the visitors.

Table 5.0: Separation of car parks for visitors and senior staff

S/No.	Name of Institution	Provided	Not provided
1.	University of Jos, Plateau State.	1	
2.	Federal University Lafia, Nasarawa State.	1	
3.	Federal University of Technology Minna, Niger State.	1	
4.	Federal University Lokoja, Kogi State.	1	
5.	University of Ilorin, Kwara State.	1	
6.	University of Agriculture Makurdi, Benue State.	1	
7.	University of Abuja, (F.C.T.).	1	
	Total	100%	0%

Table 6.0 shows that only 14% of Institutions studied consider providing the minimum stand-off distance for the senate building while 86% did not consider providing the minimum stand-off distance. The stand-off distance can provide tremendous protection, if public and vehicle access is kept sufficiently away from the building's occupied areas. The lack of stand-off zone is a major issue in the research areas. This leaves the senate buildings without this very important protection.

Table 6.0: Minimum stand-off distance

S/No.	Name of Institution	Considered	Not considered
1.	University of Jos, Plateau State.	1	
2.	Federal University Lafia, Nasarawa State.		0
3.	Federal University of Technology Minna, Niger State.		0
4.	Federal University Lokoja, Kogi State.		0
5.	University of Ilorin, Kwara State.		0
6.	University of Agriculture Makurdi, Benue State.		0
7.	University of Abuja, (F.C.T.).		0
	Total	14%	86%

Plate II: Insufficient standoff distance at the senate building of Federal University Lafia, Nasarawa State.

The findings from the research showed that most of the senate buildings did not use passive security measures to secure the buildings or the passive security elements available within and around the building premises were not put there for security purposes but for aesthetics, also from the survey conducted during the research, most of the senate have a large expanse of land to implement the passive security measures that were discussed , despite the fact that passive security measures are best implemented at the initial design stage, existing public buildings can be upgraded to meet the required standard of security.

CONCLUSION

Passive security measures are best put in place at the initial design stage but it has been discovered in Nigeria that even in places where passive security measures are said to be implemented, the approach was more of a reactive rather than proactive one, because it was used in reaction to occurrence of security threats, passive security measures should be integrated within site and structures during the early and design phases of new construction project rather than during subsequent additions or renovation. If an attack seems possible it is better to take precautionary measures to avoid or reduce damage done by employing Crime Prevention through Environmental Design as a process to reduce architectural vulnerability. Incorporating CPTED can significantly reduce the fear and risk of crime as well as the considerable costs associated with hiring security personnel. As security becomes an increasingly significant factor, it is important that a holistic approach is taken to develop integrated strategies that provide appropriate and balanced responses. Although in passive security design it is not possible to totally eliminate all risk. The goal is to balance the security design implementation with the likelihood of an occurrence of an attack in a prioritized approach that results in the acceptance of a conscious and acceptable level of risk to the public.

RECOMMENDATIONS

I. Landscaping element such as bollards, kerbs, and hedge plants should be used in defining access within and around the premises of public buildings. Distance between bollards should not be more than 900mm and same with height. Kerbs should have a minimum of 300mm height from finished surface.

II. Single and arrayed parking system should be avoided; landscape elements should be used to provide buffer zones so as to reduce the effect on the other vehicles in bomb blast situation.

III. Stand-off distance should be well defined using natural elements (sustainable materials) to provide appropriate vehicular barrier and all car parks should be outside the stand-off distance even those of the workers.

IV. The Reduction of hostile vehicle approach speed by introducing Chicanes/bends and offset approach to buildings will significantly mitigate the threat from penetrative vehicle-borne attack.

V. The Provision of design solutions which may include multiple perimeters, as a layered defense to further prevent threats from reaching their targets is strongly recommended.

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SUSTAINABLE URBAN TRANSPORTATION SYSTEMS

COMMUTERS' ASSESSMENT OF INTRA- CITY BUS SERVICE IN KADUNA METROPOLIS, NIGERIA

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In spite of the impertinence of public transportation in the efficient functioning of any society, bus service in developing countries is frequently insufficient to meet the growing demand of the commuters. This study investigates commuters' assessment of intra-city bus services in Kaduna metropolis. Through the aid of questionnaire administration, interview and physical observation, the study collected data from the commuters and commercial bus operators on the dominant public transport routes in the metropolis, challenges faced by the commuters in the use of the bus service, commuters trekking distance from trip origin/destination to the nearest bus stop, level of satisfaction with current bus service and commuters willingness to pay for service improvements. Descriptive statistical techniques like tables of percentage and graphs were used to analyse the data. The result shows that the major challenges faced by commuters in the use of bus service is traffic congestion and delay in transit, majority of the commuters (77.3%) of the commuters walk between 1-500 metres to get to the nearest bus stops and 79.3% waited between 1-10 minutes before the arrival of bus. Most commuters (96.7%) were not satisfied with the level of bus services provided due to the preponderance of bus overcrowding and delay in transit. However, an overwhelming majority (86%) are willing to pay for service improvement particularly in the area of safety, comfort and reduction in transit time. The study recommends policy and operation actions like; bus priority measures, improvement in the road transport infrastructures, stakeholders enforcement team, bus route and drivers discipline so as to raise the current bus service level and by implication the efficiency of economic activities in Kaduna metropolis.

Keywords: Bus, Commuters', Infrastructure, Metropolis, Service, Transport.

INTRODUCTION

The world demand for transport services is growing at alarming rate, global demand for passenger transport service was predicted to grow from 26 trillion passenger kilometres in 1990 to 103 trillion passenger kilometres in 2050 (Schafer and Victor, 1997; USA DOT, 1999). Unfortunately, the rapid growth in transport demand strains the transport capacity unit as a result of inadequate expansion in transport physical infrastructure. Consequently, this situation poses capacity crisis, which generates increase in congestion, pollution and safety problems. Public transport systems provide the most efficient means of moving large numbers of people, especially in densely populated urban centres. In addition to the well-being of its users, public transport plays a vital role in the productivity of cities which, in turn, has a direct bearing on the national economy (World Bank, 2001, Lyndon and Todd, 2006). Public transport is defined as a system whereby passengers or goods are carried by either private or public carriers for money (Adeniji, 1984). It connotes the act or means of conveying large number of people as opposed to conveyance by individual vehicle carrying very few people at a time.

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Oluwole, & Tolufashe (2018). **COMMUTERS' ASSESSMENT OF INTRA- CITY BUS SERVICE IN KADUNA METROPOLIS, NIGERIA.** Contemporary Issues and Sustainable Practices in the Built Environment. School of Environmental Technology Conference, SETIC, 2018

In most cities of developing countries buses are the major mode of public transport and are often the only one affordable to the poor. Most urban cities in Nigeria are bedevilled with poor quality transport services which tend to defy various remedial measures; journey times from one point to another have remained unreliable and residents have continued to face disturbing inconveniences in transportation services like high transport fare and delay. The problem is no longer limited to traditional cities like Lagos, Ibadan, Benin-City, Port Harcourt, Abuja, Kano and Kaduna. (Ogunsanya 2002; Ogunbodede nd), but virtually every state capital city in Nigeria today faces the problem of poor public transportation services (Moses2011).

In the past two decades, the city of Kaduna has being experiencing rapid population increase and physical expansion due to influx of immigrants from rural areas to the city, the 2006 census put the population of the state at 6,113,503 people with an annual growth rate of 2.47%. This growth has been accompanied by a substantial expansion of city's boundaries and much higher level of industrial, economic and social activities. These have led to the extension of low income unplanned settlement at the city peripheries and workers from the area exerting increasing pressure on already inadequate transport facilities. Ezema (2004) observed that the high cost of purchasing cars and maintenance in Nigeria, the spread of sub-urban and transformation of villages into dormitory settlements, have also created residential-to-work transportation problems in metropolitan cities due to poor public transportation system. The growing demand for intra-urban bus services in Kaduna metropolis is not met by government-owned bus services and this has encouraged the growth of unorganized private small bus operators.

The quality of living and working environment in Kaduna metropolis is gradually being eroded by massive traffic jam, excessive noise, overcrowding and difficulties in commuting to and from work using public transportation (Obansanjo and Francis, 2015). This paper examined level of passenger satisfaction with public transport (bus) service in Kaduna metropolis. The study provides information on:

i. The walking distance of passengers to the nearest public transport bus stops.
ii. The average waiting time of passengers at bus stops before the arrival of the bus.
iii. Passenger satisfaction with the current level of bus service and
iv. Passengers' willingness to pay for improvement of bus service?

The focus of the study within Kaduna metropolis are the industrial area (Kakuri), high vehicular traffic/commercial area (Leventis Roundabout), travelling route (Kawo overhead bridge), Low vehicular traffic area (Tafawa Balewa Roundabout), residential area (Kawo New Extension) and controlled site (NAF base) in Kaduna.

Reviews on Public Transportation in Nigeria

Nigeria's internal transport system depicts a lopsided modal development in favour of the road. Road transportation accounts for over 90% of both freight and passenger transport movement in the country. Whereas the road is good for short to medium distance freight haulage, it is currently almost solely responsible for the carriage of bulk goods across the country (Obansanjo and Francis, 2015). A study of the changing morphology of many Nigerian cities gives an insight into the evolution of public transport problems in Nigeria; most of the scholars who have worked on public transport problems in Nigeria have identified congestion as the most serious problems in urban centres. Congestion occurs when transport demand exceeds transport supply at a specific point in time and in a specific section of the transport systems. Under such circumstances each vehicle impairs the mobility of others (Aderamo, 1998).

Associated with the traffic congestions are problems of parking (Obansanjo and Francis, 2015), parking demands far outweigh the available supply in most Nigerian cities (Kombs, 1988). This result in road-side and illegal parking which are common features in urban centres of Nigeria, the ineffective regulation and enforcement of parking has further worsened the situation as vehicles spend majority of their time parked thereby creating land consumption problems especially in the Central Business Districts (CBD's). Unfortunately, the more parking facilities provided, the greater the demand for more because there is continuous increase in motorization (Ogunbodede, 2004). Accidents frequently occur on roads in Nigerian urban centres, urban environments are the most prone to motor traffic accidents because 75% of traffic accidents take place in built-up areas or cities (Aderamo, 2002). This is due to the underlying factors of undue concentration of vehicles in urban areas,

traffic mix and the resultant flow conflicts. Most of these accidents happen due to the general impatience and ill-tempered nature of road users and the conflict between pedestrians and the different means of road transport in the cities (Ogunsanya, 1993).

Movement within urban centres is a function of several factors: the road capacity and pattern of network, population, housing structure, and increased population of vehicles (Obansanjo and Francis 2015). The factors affecting commuting time determine the efficiency of how people move within urban centres. When movement is faster, it saves commuter's time and when movement is slow considerable time is lost. According to Aderamo (2008) public transport is the major means of commuting to work, market, recreation areas and school in Nigeria. In urban centres several problems affect commuting time. Among the common ones identified in literature include inadequate technical and material resources, the implication of land use type on transportation, incongruence in road designs for traditional urban centres and modern socio-cultural characteristics, high rate of accident became of insufficient transport infrastructure (Baro, 1984). Sule (2008) observed that free running time made up 73% of total journey time. According to him, the main causes of delay were bus stand delay, stationary delay and general delay. Furthermore he noted that travel time is an important variable in explaining travel impediment, run choice and mode choice. Travel time has similar connotation with commuting time. Commuting time affects the timeliness or lateness of arriving at destination which is an outcome of interactions among road infrastructure, type of urban transport mode, vehicular population and traffic congestion among others.

According to Aderamo (2002), one of the challenging issues in the provision and management of urban transport service in developing countries is the affordability, due to ineffective regulations, poor enforcement of operational standards, inefficient management practices and low level of technological base, the provision of urban transport services are highly unorganised in many developing countries in Africa particularly in Nigeria This unorganised nature of urban transport operation has caused undue high cost of public transportation service, because exorbitant transport fares are usually charged by the bus operators. The high cost of transport fares compels urban residents to spend a large portion of their income on mobility with its attendant socioeconomic problems.

The operation of public transportation in Nigeria is mainly undertaken by private operators. In fact, between 95 and 98% of public transport services in cities like Lagos, Ibadan, Port Harcourt, Kano, Minna, and Kaduna are provided by the private operators (World Bank, 1990, Adeyemo, 1996 and Aderamo, 2010). In some cities like Minna, Kano and Abuja, buses are provided by the state governments to the private transport operators either in form of loan or hire-purchase, but the actual operation is undertaken by the private operators.

Nigerian cities are characterized by low level of car ownership; there is an average of 4 cars per 1000 population which translates to about 0.004 car owned per person (Adesanya 2011). This low level of car ownership leads to high dependence on public transportation which in most cases is grossly inadequate and inefficient. Commercial bus operation alone accounts for about 90% of public transport services in Nigerian cities; the remaining 10% is shared between Taxis, motorcycles, tricycles and walking. Commercial buses of different sizes are assigned to ply major city routes with little or no regulations in terms of operational standards, fare charging, fare structure and determination. The only known fare and routing regulator is the National Union of Road Transport Workers (NURTW). This Union regulates and controls the activities of its members who provide about 95% of bus services in cities. This is contrary to what is obtainable in many developed countries where regulation and control of public transport services are done by the government agencies.

METHODOLOGY

Based on the focus of the study, data were collected on the dominant routes used by commuters' in the metropolis, available transport infrastructure on the selected routes, predominant challenges faced by the commuters and operators, general quality of urban bus services and commuters' Willingness To Pay (WTP) for better services. The data were collected mainly from the commuters, road transport union (NURTW) and operators of the public transport service through the instruments of physical/personal observation, interview and questionnaire administration. The questionnaire was sectioned into three segments: socio-economic status of the respondents, commuters' bus riding experience and challenges faced by commuters/operators. One hundred and fifty sample size were adopted by convenience following Adhre et'al (2008) which suggested a manageable sample size in

order to improve the quality and accuracy of research work especially where the population is homogenous. Systematic sampling technique was used in the selection of samples, the survey points were Kano Road, Barnawa Complex, Ungwan Gwari, United and Television Garage. The data collected were analysed using descriptive statistics of cross-tabulation and charts.

DISCUSSION OF RESULTS

Predominant Challenges Faced by the Commuters'

The public transport sector in the study area is dominated by the informal (private) bus transport operators, with low fleet size and aged vehicles, as presented in figure 2, traffic congestion ranked highest among the challenges encountered by the commuters with a of 83.3%. This is not surprising because the studied routes lie at the heart of the metropolis where the major arteries linking the residential neighbourhood to the commercial and industrial zone were located. Kaduna metropolis has over 20 major routes, more than 87 major/minor bus stops and about 4,273 registered buses for intra-city services (Kaduna State Ministry of Works and Transport, 2012). The congestion is accentuated by numerous unconventional bus stops where the bus drivers pull to a stop to pick prospecting passengers after a bang on the vehicle body by the assistant driver (Conductor). At times, in attempt to edge out competing drivers, some drivers can stop in the middle of the road only to stop another five metres interval to pick another passenger hence causing unnecessary delay, traffic congestion and long transit time.

Table 1: Challenges Encountered by the Commuters

Challenges	Frequency	Percentage
Traffic congestion	125	83.3
Overcrowding	9	6
Delay	9	6
Police checkpoints/illegal parking	4	2.7
Bus Breakdown	3	2
	150	**100**

Apart from this traffic congestion, overcrowding of bus (*Ataimaka: an informal practice in which Passengers seats on the bus engine behind the driver or inside the booth as presented in figure 1*) and delay were ranked second with 6.7% each. Interestingly, these figure although is low is perceived by the passenger as the second most vexing attitudes prolonging commuting time in the study area.

Fig. 1 showing a commercial bus carrying passengers in the booth

Ironically, the transporters benefit from this attitude of bus overcrowding because such passengers sometimes pay 1/3 or ½ of the standard fare because they perch on the tiny space behind the driver's seat and sometimes in the booth This was perhaps perceived as a big challenge because when the passengers want to board or alight from the bus, it takes even longer time than the normal passenger. Such overloaded bus could have as high as fourteen to sixteen passengers instead of the recommended ten. Poor notification of the point to alight and indiscriminate disembarkation from vehicles were interrelated and contributing to delay/

increase in commuting time. Police checkpoints/illegal parking and vehicle breakdown also contribute to the challenges experienced by commuters to a marginal value of 2.7% and 2% respectively.

Commuters Walking Distance to Bus Stops

Passengers' walking distance from trip origin or destination to the nearest bus stop is one of the important elements that determine the quality of bus service. Walking distance to bus stop can be defined as the distance passengers walk before reaching the nearest bus stop from either the trip origin or destination to catch bus services. The World Bank (2000) recommended walking distance of 300-500 meters from trip origin/destination to the nearest bus stop in a high density area and a distance in excess of 500 meters for low density. In the same vein areas with walking distance of 1-200 metre is considered to have good access to access points, 201-500 meters as moderate access and areas with walking distance of 500 metres above has poor access.

Table 1 Commuters Walking Distance to Bus Stop

Commuters Walking (in Metres)	Survey Location					Total
	Television Garage	United Rd	Kano Rd	U/ Gwari Bus Stop	Barnawa Complex	
1-100 metres	19	10	30	30	30	119
	12.7%	6.7%	20.0%	20.0%	20.0%	79.3%
101-200 metres	3	8	0	0	0	11
	2.0%	5.3%	0.0%	0.0%	0.0%	7.3%
201-300 metres	1	8	0	0	0	9
	0.7%	5.3%	0.0%	0.0%	0.0%	6.0%
301-400 metres	4	4	0	0	0	8
	2.7%	2.7%	0.0%	0.0%	0.0%	5.3%
401-500 metres	1	0	0	0	0	1
	0.7%	0.0%	0.0%	0.0%	0.0%	0.7%
501 and above	2	0	0	0	0	2
	1.3%	0.0%	0.0%	0.0%	0.0%	1.3%
Total	30	30	30	30	30	150
	20.0%	20.0%	20.0%	20.0%	20.0%	100.0%

The result in table 2 above show that 79.3% of the commuters walked between 1-100 meters to access the nearest bus stop, 7.3% walked between 101-200 metres, 6% walked between 201-300 metres and a marginal 1.3% walk 501 metres and above to access the nearest bus stops. This means that commuters in the study area have moderate access to public transport access points. The usual practice of passengers walking along the bus route waving to stop the bus in any location may have contributed to making the walking distance look shorter than what it is in real life, if such movement is toward the designated bus stop.

Passengers' Waiting Time at Bus Stops

An important characteristic of a transport service is the time passengers have to wait before boarding a vehicle. In the context of this study waiting time for bus is defined as the time passengers spent at the bus stop upon arrival with the intention of catching bus and the time the passenger boarded and departs from the bus stop. The best and optimal waiting time as recommended by the World Bank (2000) is 1-10 minutes for high quality service and 11-20 minutes for a moderate quality bus service. The result for the study area is presented in figure 1.

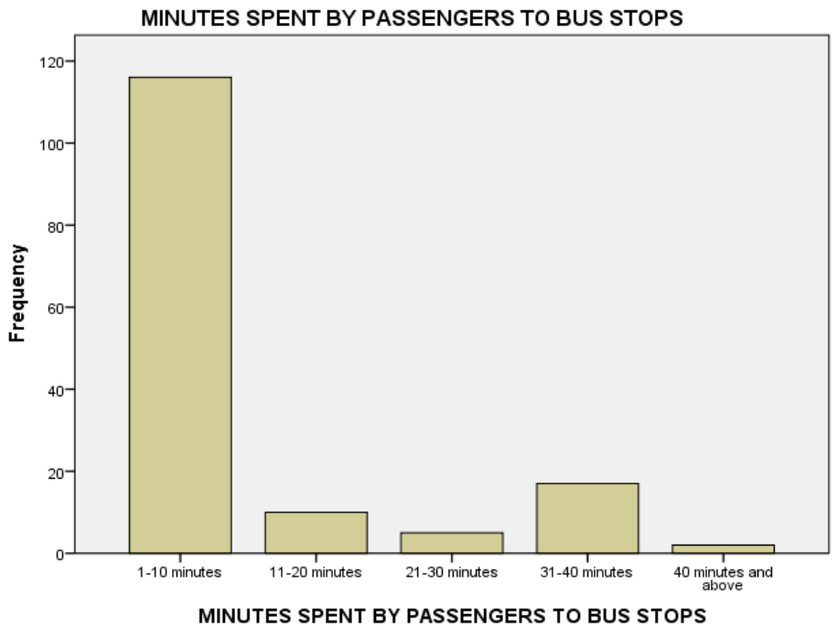


Fig. 1 Commuters Waiting Time at Bus Stop

Figure 1 reveals that majority (116 or 77.3%) of the commuters spent between 1-10 minutes at bus stops, while 11 or 7.3% spent between 11-20 minutes at bus stop and 20 or 13.3% of the commuters spent between 31-40 at the bus stop. The implication of this result against World Bank (2000) guideline is that using the indices of waiting time at bus stop, the quality of bus service in Kaduna metropolis good.

Commuters' Satisfaction with the Level of Bus Service and Willingness to Pay for Service Improvement

Satisfaction with bus service indicates high level bus service performance in relation to the service qualities of convenience, safety and affordable transport fare. As observed in the table 2, 3.3% of the respondents are satisfied with the level of bus services while 96.7% are not satisfied with the level of services provided by buses in the area.

Table 2 Commuters Satisfaction with Bus Service

Level of Commuters Satisfaction	Survey Locations					Total
	Television Garage	United Bus Stop	Kano Road Bus Stop	Ungwan Gwari Bus Stop	Barnawa Complex Bus Stop	
Satisfied	1	0	0	4	0	5
	0.7%	0.0%	0.0%	2.7%	0.0%	3.3%
Unsatisfied	29	30	30	26	30	145
	19.3%	20.0%	20.0%	17.3%	20.0%	96.7%
Total	30	30	30	30	30	150
	20.0%	20.0%	20.0%	20.0%	20.0%	100.0%

This indicates a general poor level of bus services in the study area. Commuters who are not satisfied with the bus services emphasized that the problem of overloading, delay in picking and dropping passengers, poor attitudes and behaviour of the bus crew to the passengers and frequent fare hike are the reasons for their dissatisfaction.

Table 3 Commuters Willingness to Pay for Service Improvement

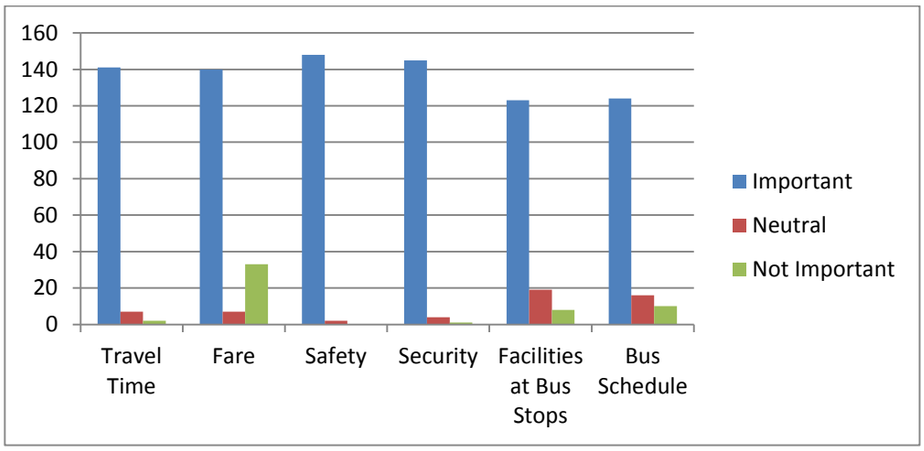
Willing To Pay For Better Service Improvement	Survey Location					Total
	Television Garage	United Road	Kano Road	U/ Gwari Bus Stop	Barnawa Complex	
Yes	16	28	30	26	29	129
	10.7%	18.7%	20.0%	17.3%	19.3%	86.0%
No	14	2	0	4	1	21
	9.3%	1.3%	0.0%	2.7%	0.7%	14.0%
Total	30	30	30	30	30	150
	20.0%	20.0%	20.0%	20.0%	20.0%	100.0%

Table 3 shows that 86% representing 129 of the total respondents are willing to pay extra or additional fare in order to enjoy better bus services and, while the remaining 14% representing 21 of the respondents did not see any reason why additional cost should be incurred in order to enjoy better bus services. It could then be concluded that majority of the commuters within the study area are willing to pay extra fare to enjoy better services. This result corroborated with the high value (96.7%) of the passengers who are not satisfied with the existing level of service.

Improvement Passengers Want to See in Public Transport

The desire of the passengers to pay extra for better service improvement necessitate investigation into areas the passengers wants the improvement to be focused, the result is presented in figure 2.

Figure 2 Improvement Passengers Will Like To See in Bus Service



On the very important ratings, Safety has the highest frequency of 148 (98.6%) followed by Security with 145 (96.6%), reduction in transit time 141 (94%), Fare 140 (93.3%), Bus Schedule 124 (82.6%) and the least is Facilities at Bus Stop with 123 (82%). This simply means that virtually all the passengers desire to see improvement in all the bus service elements, but the recognition of the importance of safety is very important. On the not important rating, the transport fare ranked highest with a frequency of 34 or 22.6%, this suggest that the commuters appreciate the fact that there cannot be any better service improvement that will not attract financial cost.

RECOMMENDATIONS

Based on the results and findings of this study, the following recommendations are advanced towards improving the quality of bus service in Kaduna metropolis.

i. The private operators, state and local government authorities should improve the existing vehicle, road and traffic control infrastructure in the metropolis; this should be supported by proper education of road users in general on the importance of obeying traffic rules

and operating safely as a measure to ease the flow of traffic, reduce delays and traffic congestion in the metropolis.

ii. The use of conventional mass transit buses which can move large number of people at once should be adopted as against the current mini buses in the system. This will not only reduce the number of vehicles on the road but will also reduce traffic congestion and long transit time currently been experienced in the metropolis and

iii. Bus priority measure should be encouraged by the traffic management agencies in order to facilitate fast and efficient movement of buses within the metropolis. This can be achieved through the delineation of bus route across the neighbourhoods of the metropolis; this should be backed up with strong enforcement task force to prevent abuse.

iv. Stakeholders' enforcement team comprising of Kaduna State Traffic and Environmental Law Enforcement Agencies (KASTELEA), NURTW, Federal Road Safety Corps (FRSC) among others should be constituted to control illegal parking, bus overloading, picking and dropping of passengers at undesignated bus stops as a measure to reducing level of dissatisfaction with the bus service by the commuters and increase the level of safety in the use of the bus service in line with the expectation of the commuters of the Kaduna metropolis.

CONCLUSION

The moderate waiting and walking distance encountered by commuters in Kaduna metropolis notwithstanding, commuters are still highly not satisfied with the city's bus services, this is perhaps because of long in-vehicle time, bad seating arrangement occasioned by bus overloading, untidy buses, lack of safety measures and poor maintenance of buses by the operators. To raise the current service level of bus service in Kaduna metropolis and by implication the efficiency of the city itself, the recommendations outlined above should be implemented.

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USERS CIRCULATION SATISFACTION IN NNAMDI AZIKIWE INTERNATIONAL AIRPORT (NAIA) TERMINAL BUILDING ABUJA, NIGERIA

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Transportation buildings are comprised of unique configuration of architectural design elements of which airport terminal building is an example. In meeting with user's requirements, airports design needs innovative architectural solutions. Users may be passengers, Airport employees, Airline worker's, and guest or visitor that requires varying architectural needs for different spaces and circulation considerations. The main thrust of this study is to determine the standard space requirements in Airport Terminal Building facilities, in order to access user's satisfaction, and identify root causes of circulation issues, rising dissatisfaction level of users with provision and to formulate necessary solutions towards limiting dissatisfaction. The case chosen for study is the Nnamdi Azikiwe International Airport Abuja (NAIA). Data was obtained using questionnaires. After the analysis, it was discovered that the circulation system of the airport terminal building does not meet with the requirements of users. The findings of the research therefore vitrines the design requirements for effective design of airport terminal building that meet the needs of the users.

Keywords: Airport design, Circulation facilities, Space, Transport Building, Users satisfaction

INTRODUCTION

Transportation buildings are composed of unique applications of architectural design of which Airport terminal building is a good example. Towards meeting user's requirements, airports design is approached through different types of architectural solutions. Air transport is however relatively expensive but adjudged the most reliable, efficient, safe and dynamic mode of transportation. This mode of transport is concomitant to the development of any economy, as reaction efforts towards ensuring a sustainable air transport system is of major concern to the operators. Hence the need for effective management of airspace systems and airport infrastructure for safe and reliable aircraft operations, of utmost necessity (Orimoloye, 1996). Three basic facilities are needed for efficient air transportation which include the network, terminal facilities and the carrier. The Aviation industry is still up-and-coming in developing countries like Nigeria with minimal passenger and freight patronages. Without suitable measures put in place to address this, much will be lost in both revenues on the part of the government and in cash and time on those patronizing the aviation industry. Airports are more than places where trips for air passengers and goods start or stop. They also provide a location for the concentration, the dispersion, the shipment and vehicular services. Airports also act as the interchange or interface between road and rail transport modes. Airport Terminal building is a focal point in the terminal complex. The primary users of airport terminal buildings are airlines, air travelers, well-wishers and meters/ greeters, and a wide range of employees of airport management, government regulatory authorities, air carriers, concessionaires, and other airport tenants.

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Yabagi & Isah. (2018). **USERS CIRCULATION SATISFACTION IN NNAMDI AZIKIWE INTERNATIONAL AIRPORT (NAIA) TERMINAL BUILDING ABUJA, NIGERIA.** Contemporary Issues and Sustainable Practices in the Built Environment. School of Environmental Technology Conference, SETIC, 2018

Effectively terminal facilities should, first and foremost, provide a good platform for service to these users, the planning and design of an overall terminal facility is greatly influenced by the more rigid requirements needed to accommodate maneuvering of aircraft and ground access systems. Terminal buildings consists of the interface between aircraft, travelers, and the various modes of landside transportation. Figure: 1 depicts a diagram of a generic terminal complex that shows the three key components (landside, terminal building and airside).

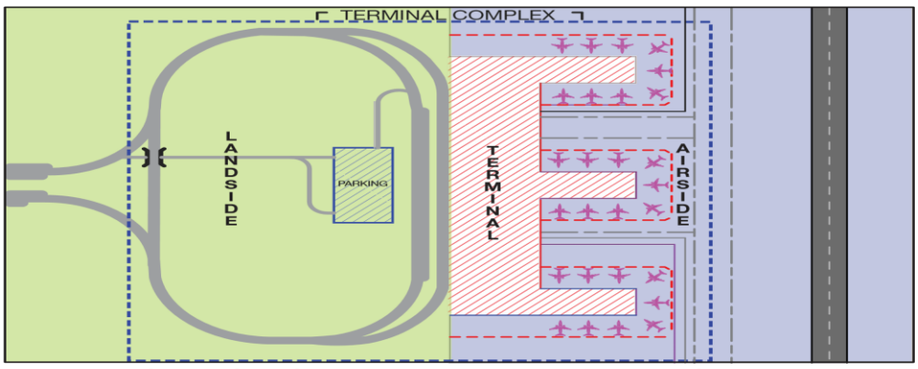


Figure 1: Typical Terminal complex Source: Landrum & Brown (2010)

Airport Facility Users

Numerous researchers consider the user's point of view the most relevant for evaluating transit performance (Ebolli and Mazzulla, 2010; European Commission, 2011; Ali, 2010, Kho et al., 2005; Fellesson and Friman, 2008). In Rhoades & Waguespack (2008) (Eboli & Mazzulla, 2011; Ndoh & Ashford, 1994) indicate that airline service quality is driven by ten key factors: on-time performance, airport check-in, schedule/flight accommodations, seating comfort, gate location, aircraft interior, flight attendants, post-flight service, food service, and frequent flyer programs. The International Air Traffic Association (IATA) conducted a survey and published under the title of "Airport Monitor" which evaluates airport services' quality through 16,000 transatlantic passenger questionnaires (Janic M 2003). Barros (2007) examined the satisfaction level of users from departing and arriving ones to the transit users who have special needs when using the terminal services. The survey was conducted with a small group (n=23) of transit passengers, a 22-item query allowed to develop needed linear regression analysis and be finalised.

Hastemoglu and Erkan (2014) examine that pedestrian flow and wayfinding with social force model in small scale airport in Turkey. Correia (2008) presented a level of service related to user perception for airport building terminals. Erkan (2014) also analyse level of service for users in small scale airport in Turkey. These research shows the level of service factor affecting user's orientation and movement ability. Yeh and Kuo (2002) proposed a measuring experience for user service quality. Manataki and Zografos (2010) proposed an evaluation model which was implemented in Athens Airport passenger terminal and which focused on the healthy functionality of a terminal building in different conditions.

Passengers leaving on a trip normally want to spend as little time as possible in the terminal. They want to have baggage carts readily available, a fast check-in, and little time waiting before and quick boarding prior to a timely departure. Also Passengers do not appreciate long line-ups, repetitive security checks, crowded departure areas, line-ups for boarding and a delayed departure. The rise in terrorist activity requires more stringent security measure. Passengers' identity must be verified, luggage must be x-rayed, metal detectors and other security techniques must be used. As a result, passengers must arrive early at the terminal hours before departure, line up at the security checkpoint, and show their boarding passes and passport numerous times and wait while luggage is matched with boarded passengers, therefore passenger, airport employees, airline workers and guest(escort) satisfaction is one of the most critical issues which are needed to be analysed carefully. The main aim of the study is to determine the standards to be used to evaluate Airport Terminal Buildings facilities, in order to access user's satisfaction, and identify root causes of circulation issues, rising dissatisfaction level of users, and to formulate necessary solutions for decreasing or limiting the dissatisfaction level(s) and also take into account of airport terminal architecture.

"Case study chosen for this is the Nnamdi Azikiwe International Airport Abuja (NAIA). This airport is chosen due to specific reasons such as its constant growing passenger

numbers, continuing development capacity, and positive effect for the Northern region airports' capacities in terms of sharing the passenger load among those airports".

"Satisfaction is the user's fulfilment response based on the judgment that a product and service or its feature provides a pleasurable level of consumption-related fulfilment (Rahaman, *et al* 2011). Also Philip, and Hazlett, (1996); Baker, (2013); Angelova, and Zekiri, (2011) observed that users Satisfaction is a judgment made on the basis of a specific service encounter and noted that users depends upon the perceived performance compared to the user's expectations and it occurs when perceived performance matches or exceeds the passenger expectations. This is a very essential part for Nigeria airlines because it is not just about the product or services being produced but the value of satisfaction perceived by the user on a continuous basis".

Circulation Control in Airport Terminal Buildings in Nigeria

At airport where there is a large number of air passengers, there is the need for sufficient shelter and space for departure and arrival purposes. The purpose of airport terminal building is to provide shelter and space for various surface activities related to the air transportation. It acts as a focal point for activities of the airport. The size of these building depends upon volume of traffic. Due to the rapid rise in popularity of passenger flight, many early terminals were built in the 1930s–1940s and reflected the popular art deco style architecture of the time. One such surviving example from 1940 is the Houston Municipal Airport Terminal.

Early airport terminals opened directly onto the tarmac: passengers would walk or take a bus to their aircraft. This design is still common among smaller airports, and even many larger airports have bus gates to accommodate aircraft beyond the main terminal (Deneufville 2008). However, the entry and exit of the terminal building must be separated and properly planned to permit one-way traffic and to avoid congestion at peak hours and for emergency evacuation. The parking system should encourage motorist to use the car park and avoid the sidewalks. The arrangement of the stands should be planned to ensure proper circulation of vehicles, pedestrians and disabled. Circulation patterns are important organizing elements of an airport terminal, reflecting both simple functional needs and more complex value structures. The system or pattern of circulation established within and outside the terminal plays an important role in shaping people's understanding and use of the terminal. Circulation patterns in any terminal should not lack simplicity and clarity. There is therefore an urgent need to improve the flow of pedestrian and vehicular traffic, and to locate material handling facilities and parking appropriately. Addressing these circulation issues through comprehensive planning, and design, will enhance the use of the terminal. For an effective circulation in an airport terminal, certain key parameters have to be considered such as vertical and horizontal circulation.

RESEARCH METHOD

Post Occupancy Evaluation (POE method was adopted for the research as this gives a view of the users' opinion of the subject matter under investigation. POE was first used by inspectors of buildings within the users permit that was released to ascertain that structures were suitable for the purpose they are designed for (Riley *et al*., 2010). According to Adedeji & Fadamiro (2012) post occupancy evaluation (POE) has generally been accepted as method of obtaining opinion of users in the built environment especially where it relates to perception studies. Also according to Zimmerman and Martin (2001), more specifically POE tests generic and specific aspects of the planning and detailed design of facility buildings. It also tests their impact on building users with respect to several parameters such as: movement inside and outside the building, health, safety and security, outdoor and indoor environment quality.

Nnamdi Azikiwe International Airport (NAIA) Abuja in Nigeria was selected because it has a varied multiplicity of users spread across the nation and the world. A questionnaire form was developed and administered to the respondents randomly from four categories of airport users. A total of 400 copies of questionnaire form was administered with 288 copies returned out of which 264 copies were valid and 24 copies were invalid giving a 66% return rate. The selection of respondents within the airport was spread amongst the users by means of a disproportionate stratified random sampling method. The category of users (passengers, airport employees, airline workers, guest /passenger escort) selected was because they formed the bulk of people to be considered in the design of the terminal buildings. Four

research assistants were designated and they were distributed amongst the four category of users to administer. The data was collated, sorted out based on the category of users and entered in SPSS for analysis purposes and the results are presented in tables and charts. Pictures of some selected terminal building interiors and exteriors are presented as plates to further explain the issues discovered and presented in the results. The calculation of the rating of selected perception questions was based on the Likert scale with the view of establishing a finite decision upon which the recommendations of the research was based.

Table 1: Category of users studied

Name of users
Passengers
Airport employees
Airline workers
Guest/passenger escort

RESULTS AND DISCUSSION

The results show that the opinion of the users varies widely in terms of circulation facilities when examined individually with respect to the airport terminal building however when combined and viewed together it gives an average opinion of the measurement. The Likert scale measurement is discussed in the first part of this section while selected specific cases are discussed subsequently.

Measurement of circulation perception

A weighted scoring of 1-4 was apportioned to the different options for choice for the respondents based of their perception of the variable being measured. The scoring of the options is stated below;

1=Very Dissatisfied, 2=Dissatisfied, 3=Satisfied, 4=Very Satisfied

The result presented in Table 2.0 shows that majority of the respondents are spread within the dissatisfied and very dissatisfied section of the scale of measurement. The number of respondents in each section is multiplied by the weighted score allocated to it, the calculation for this is shown in table 3.0 and the total score across the rows are added up and presented as the total at the end of the table.

Circulation in terminal building Rating Based on airport passengers

Table 2.0: Number of passengers per opinion on Satisfaction with circulation facilities Measured

Measured Variable	Very Dissatisfied (X1)	Dissatisfied (X2)	Satisfied (X3)	Very Satisfied (X4)	Total
Rating of width and length of corridors	102	110	10	25	247
Rating of width and length of lobbies	98	135	18	11	262
Rating of floor finishes	89	100	51	12	252
Rating of height and material of handrail	76	112	43	9	240
Rating of type of entrance	47	36	101	45	229
Rating of number of entrance doors	101	133	17	5	256
Rating of size of entrance doors	94	146	12	3	255
Rating of type of exit	19	78	111	39	247
Rating of number of exit doors	122	85	36	3	246
Rating of size of exit doors	106	120	15	9	250
Rating of means of way finding	45	34	106	41	226
Rating of seating arrangement at departure lounge	98	95	40	27	260
Rating of seating arrangement at arrival lounge	100	101	20	10	231
Rating of width of ramps	88	92	64	14	258
Rating of width of staircases	90	108	30	10	238

Table 3.0: Sum of passengers' responses on Satisfaction with circulation facilities

Measured Variable	Very Dissatisfied (X1)	Dissatisfied (X2)	Satisfied (X3)	Very Satisfied (X4)	Total
Rating of width and length of corridors	102	220	30	100	452
Rating of width and length of lobbies	98	270	54	44	466
Rating of floor finishes	89	200	153	48	490
Rating of height and material of handrail	76	224	129	36	240
Rating of type of entrance	47	72	303	180	602
Rating of number of entrance doors	101	266	51	20	438

Rating of size of entrance doors	94	292	36	12	434
Rating of type of exit	19	156	333	156	664
Rating of number of exit doors	122	255	108	12	497
Rating of size of exit doors	106	240	45	36	427
Rating of means of way finding	45	68	318	123	554
Rating of seating arrangement at departure lounge	98	190	120	108	516
Rating of seating arrangement at arrival lounge	100	202	60	40	402
Rating of width of ramps	88	184	192	56	520
Rating of width of staircases	90	216	90	40	436

The interpretation of the results obtained based on the Likert scale calculation is based on the range of scale stated as follows:

1.0	-	1.49	Very Dissatisfied
1.5	-	2.49	Dissatisfied
2.5	-	3.49	Satisfied
	>	3.5	Very Satisfied

Table 4.0: Passengers opinion on Satisfaction with circulation facilities interpretation

Measured Variable	Sum	Mean	Interpretation
Rating of width and length of corridors	452	1.83	Dissatisfied
Rating of width and length of lobbies	466	1.78	Dissatisfied
Rating of floor finishes	490	1.94	Dissatisfied
Rating of height and material of handrail	465	1.94	Dissatisfied
Rating of type of entrance	602	2.62	Satisfied
Rating of number of entrance doors	438	1.71	Dissatisfied
Rating of size of entrance doors	434	1.70	Dissatisfied
Rating of type of exit	664	2.62	Satisfied
Rating of number of exit doors	497	2.02	Dissatisfied
Rating of size of exit doors	427	1.71	Dissatisfied
Rating of means of way finding	554	2.45	Dissatisfied
Rating of seating arrangement at departure lounge	516	1.98	Dissatisfied
Rating of seating arrangement at arrival lounge	402	1.74	Dissatisfied
Rating of width of ramps	520	2.02	Dissatisfied
Rating of width of staircases	436	1.83	Dissatisfied

Plate 1: Passengers stranded at departure lounge of NAIA international wing
Source: Authors field work 2017

It can be observed from table 4.0 that majority of the respondents are dissatisfied with the circulation facilities provided for them and they also consider the type of entrance and type of exit as being the best facility in terms of circulation. There is therefore need to examine the relationship between selected variables within the study population.

Circulation in terminal building Rating Based on airport employees

Commonly there are two major categories of airport in Nigeria (domestic and international). They usually require different kind of circulation facilities conversely this barely is the case when the buildings in these airport are being planned. The only difference is typically the

office of the customs and immigration services that varies between the international and the domestic wings respectively.

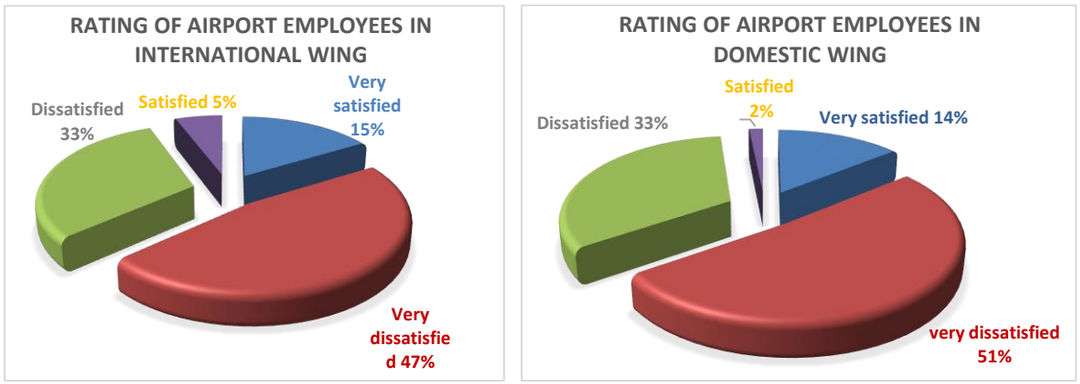


Figure 1.0: Distribution of airport employees with level of satisfaction with circulation facilities.

Plate 2: Passengers stranded at arrival and been guided by an airport employee of NAIA international wing
Source: Authors field work 2017

In figure 1.0 it can be observed that the percentage of respondents that were very dissatisfied with their circulation facilities is a little higher in the domestic wing while the respondents that were dissatisfied were equal in both international and domestic wing respectively. This can be understood because majority of the airport employees interviewed usually look up to clutch of passengers within the terminal building and the facilities are habitually poor. They also nit-picked of inadequate seating at arrival and departure lounges within the terminal building. In the case of the domestic wing, their lack of satisfaction has to do with the circulation in entrance door, ticketing point, baggage-in and baggage -out and the permanent position of furniture they are restricted to. The employee in international wing also complained of inability to rearrange the terminal building to accommodate more passengers or to hold minor assemblage talk with colleagues or passengers within the building. The percentage that considered the option as satisfactory were those at the upper cadre of class of employee based on the fact that many do not use circulation facilities often.

Circulation in terminal building Rating Based on airline workers

The cost of providing infrastructure in airport terminal buildings for airline workers in Nigeria is quite high and hence the slow rate of infrastructural provision in these airports for airliners, however there is a growing staff population in these airlines through employment and more airlines sprang up day by day. It is common to find many airline workers encouraged to share circulation facilities with other airport users. In some airport terminal buildings, the creation of new airline is not followed with the provision of new arrangements rather they share existing circulation facilities and in some cases the existing circulation facilities are divided.

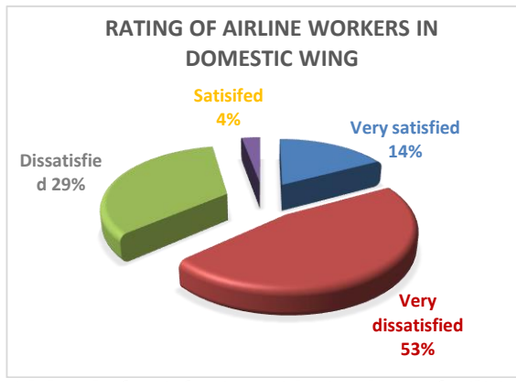


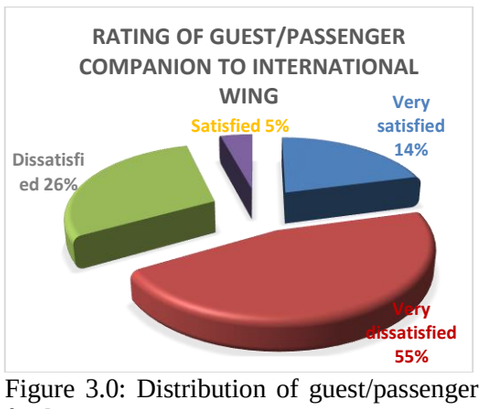
Figure 2.0: Distribution of airline workers with level of satisfaction with circulation facilities.

Plate 3: Airline worker directing Passenger to their office at NAIA international wing
Source: Authors field work 2017

Figure 2.0, shows slight difference in the percentage of respondent that were very dissatisfied with the circulation facilities of the terminal building, 53% of those in domestic wing were very dissatisfied while 41% was the case in the international wing, 33% were dissatisfied in international wing while 29% were dissatisfied in domestic wing. The key reason for the high level of dissatisfaction with the circulation facilities in the domestic wing was the influx of passengers at peak hours and other users of the terminal building, Figure 2.0 goes to show that circulation is not just the requirement of those in domestic wing but it also affects those in international wing.

Circulation in terminal building Rating Based on guest/passenger companion

In Nigeria, guest or passenger-companion are not considered when designing an airport terminal building, nevertheless there is an increasing rate of guest or passenger-companion population in these terminal building as a result of various means of transportation to the airport, a passenger may come with five or more companion to the airport and even more than one car this gives airport authority (FAAN) great concern on how to go about to accommodate this category of terminal building users, therefore brings the slow rate of circulation facilities provision in these airports for this category of users. The circulation facilities available are been shared between the guest or passenger-companion and other users of the airport, consequently brings cross circulation among the users.



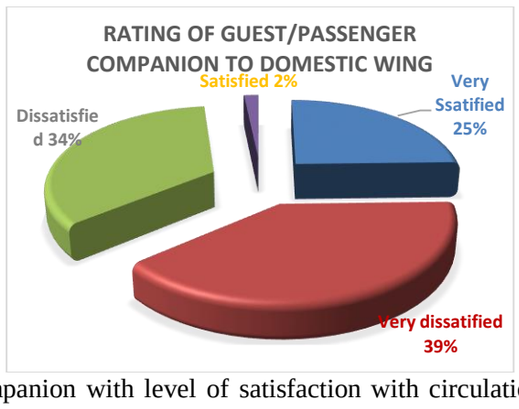


Figure 3.0: Distribution of guest/passenger companion with level of satisfaction with circulation facilities.
Source: Authors' fieldwork (2017)

Plate 4: Passengers escort stranded at NAIA international wing
Source: Authors field work 2017

Figure 3.0, shows significant difference in the percentage of respondent that were very dissatisfied with the circulation facilities of the terminal building. Consequently 55% of those in international wing were very dissatisfied while 39% was the case in the domestic wing. The fundamental reason for the high level of dissatisfaction with the circulation facilities in the international wing was the influx of passenger's guest/companion at peak hours and other users of the terminal building,

CONCLUSION

The need for circulation control in many airports in Nigeria to aid user's activities within the terminal building is quite enormous, however the management, Federal Airport Authority of Nigeria (FAAN) of these airports should begin to consider the need to provide facilities that meet the need of the users. During the course of the research many passengers considered the other users of the airport as having better circulation facilities and hope that someday they would get similar facilities, however going by the current rate of infrastructural development this dream is unrealistic. The good option is for management to begin to examine how they could make the current available facilities to work well and be accepted by the current users such that they would be satisfied with the facilities hence reducing the demand for newer facilities on the account of dissatisfaction of the current one. In conclusion it is apparent that any user not satisfied with the circulation facilities present in the terminal building would most likely not be pleased which in turn affects the overall image of the airport. It is therefore recommended that users should be allowed to make inputs in design of airport terminal building and the planning of the existing facilities.

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ASSESSMENT OF CIRCULATION SAFETY DESIGN FEATURES IN TRAIN TERMINAL BUILDINGS IN NIGERIA

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Consideration for people's interaction and space requirements is always a concern in building design. Dynamics of movement and users' behaviour vis a vis number of occupants and objects within the space are essential. In public buildings such as Train terminals, ensuring the users' safety and security is even more challenging, especially during disasters and emergency situations where safe and a speedy evacuation of large crowds from densely populated areas become essential. This research therefore examines safety design as a tool for enhancing the wellbeing of users of train stations in Nigeria. The research method adopted for this study is descriptive survey method in which qualitative data were collected through scheduled observations. The results were analyzed and are presented in tables and charts while the pictures are presented in plates. The study revealed that safety in train stations is possible using pedestrians' circulation safety design variables. The paper thereby made recommendations on the aspects of the building where the architect can use the specific safety designs to achieve users' safety and security, especially during disasters and emergency situations.

Keywords: Emergency, Movement, safety, space, Users.

INTRODUCTION

A train station or railway station (also called a railroad station, rail station, or depot) is a place where passengers can get on and off trains and/or goods may be loaded or unloaded (Fruin, 1993). Stations are next to a railway line, or they are the terminus for a route. They are platforms to let passengers get on and off the trains easily and safely. Early stations were usually built to handle passengers and goods. Today, goods are usually only unloaded at big stations/terminals.

In Nigeria, there are currently eight railway terminals according to the Nigerian Railway Corporation, NRC, (2014). The railway transportation sector which has been side-lined over the years is been resuscitated as some of the existing stations and terminals are put to use as well as the construction of new ones. The station environment where the passengers get on and alight from trains is of significant importance because it has the capacity of affecting their safety as well as that of the staff of the terminal. According to Aysu et al (2008), ensuring the safety and security of the occupants in public buildings, is even more challenging, especially during emergency situations and disasters where speedy and a safe evacuation of large crowds from densely populated areas is essential. It is therefore paramount to ensure that terminal building that basically serves the purpose of getting passengers in and out of the trains aid their safety in the process of achieving their goal. This is achieved through a design process that allows for information regarding the facility to be collated and used in the design parameters. The need for considering the safety of users of the terminal is of importance because the safety perception of people varies, however a general range could be provided to accommodate their needs.

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Railway Transportation in Nigeria.

Railway system started in Nigeria in 1898 following the laying of the first railway track in the South West (Lagos to Ibadan) by the colonial administrators (Ayodele, 2000). By this history, Nigerian railway system is one of the first generation railway systems in the world. The nation's railway network was designed to facilitate the flow of goods in a North-South fashion, goods such as groundnut, cocoa and cotton from the inlands to the coast for shipment to Europe. The railway system was generally efficient in its early years of existence and up till late 1970s, (Adesanya, 2002). The single-track narrow gauge network ran diagonally across the country and was used to move agricultural products from the north to the seaports in Lagos and Port Harcourt. Rail development in the country coincided with the era of groundnut pyramids in the north, cocoa from the west and palm oil produce from the east. Following the discovery of crude oil in commercial quantity and the subsequent transition to a petro-dollar propelled economy, the nation's rail tracks were abandoned as agricultural commodities ceased to be the mainstay of the economy. There was no need to transport crude oil through the railways system since it was produced in the coastal areas and was easily pumped into vessels for shipment (Hale 2009).

Currently, majority of the Nigerian railway facilities are still in their abandoned states. The stations, Terminals and the railway tracks are deteriorated by the day as there are out of use and operation. It is also true that none of the Nigerian cities currently has an operational intra-city rail system. However, two major intra-city rail systems are currently being developed; these are the Lagos light rail and the Abuja light rail projects (Hale 2009)

Circulation safety in Railway Terminals

In the built environment, the fundamental principle for safety is to ensure that the occupants of a building are safe especially during emergency events as well as the normal conditions (Venuti et al 2009). Safety issues considered in the design of railway terminals and other buildings alike include a wide range of considerations depending on the capacity of the building as well as the characteristics of its users. These safety design requirements are captured in building codes and handbooks on terminal building safety. However, according to Fruin (1993), the fulfilment of building code requirements for an issue is not an assurance to efficient functioning of building during everyday use and emergency situations. Hale, et al, (2007), stressed also that Over-reliance on standards may limit the designers to fully express their design ideas or to develop better design solutions for special cases. The term "over – reliance" as used by Hale et al may also create a danger by limiting the responsibility of the designer, causing idleness by avoiding certain design issues because they are not stated in codes of practice or standards.

Empirical data have shown that casualties during an emergency evacuation are usually not as a result of the actual disaster, but the impulsive behaviour of the crowd under panic. To minimize casualties, it is therefore important that architects and engineers design buildings optimized for panic evacuation. Individual's behaviour under stress is difficult to predict since people's reaction and response to the same situation differ. This can be attributed to the variation in age, gender, cultural differences, athletic abilities and past experiences (Helbing and Farkas 2000). However, the behavior of the crowd tends to follow some common characteristics independent of the specific case during an emergency. This has been witnessed during egress situations whereby people ramp and trample others with the sole goal of ensuring their own safety. This ultimately makes emergency evacuations more difficult and dangerous than coordinated evacuations as it slows down the evacuation rate.

Crowd dynamics

According to Still (2000) in his PhD Thesis - "crowd dynamics can be defined as the study of the how and where crowds form and move above the critical density of more than one person per square metre". There is every possibility for overcrowding and personal injury at high density. It therefore becomes important to understand the dynamics of crowds, how management systems affect crowd behaviour and crowds understanding and interpretation of information systems. It has been pointed out by Averill et al (2005) that the objective elements include density and the available space while the subjective elements include a perception of both the available space and the number of people present.

Crowd dynamics is all about the study of the general behaviour of crowd. It answers the where, how and when question of crowds formation. Peoples' behaviour may be affected by others behaviour and the conditions of their immediate environment due to their interactions

with the space (Sagun et al 2008). The density of the surrounding crowd affects the speed of each person and individual behaviours due to personal characteristics and their response to environment can be included to modify the locomotion. Crowd's behaviours show different characteristics compared to individual behaviour and people's behaviour during disasters differs from that of normal conditions. People do not like their lives and activities interrupted and interfered with, so they would follow routines and see warnings as an "exercise" ignoring the signs in order to continue with their normal behaviour when they are faced with a disaster (Boer and Skjong, 2001).

Crowd management

Crowd management is the process of controlling the behaviours of large groups of people for their own safety and security. It involves planning, organization, guidance and evaluation activities. Crowd safety and security in public areas are the responsibility of the organisers or operators. The basic requirement of a health and safety management system is to monitor and control potential crowding risks in public spaces. There are four interacting elements that need to be considered to minimize injuries and death during crowd situations. They are defined as: time, space, information, and energy (Fruin 1984). He explained time as the crowding period; space as the size and layout of the occupied area; information as the perceptions of the people in the crowd to take some group action; and energy as the pressures created by the mass of people that can cause accidents and death. It is within this context that crowd management considers the elements of events where crowds are involved dealing with the facility, size, behaviour of the crowd, means and routes of entrance and exits, communication, jamming and queuing. Another fact observed from crowd incidents is that different types of crowds behave in different ways during disasters. It is necessary therefore to have information on different types of occupants (in terms of age, sex, abilities, etc.) to predict the possible problems. For instance, violent behaviours of fans can be regarded as a potential risk in sports arenas. In like manner, trying to evacuate people in a residential building at bed time can slow down the rescue process.

Figure 1: The Risk Management Process
Source: Hani (2009).

Design and Management of Entrances and Entry routes

The design and management of building entrances and entry routes should take into account the design and location of the facilities so as to allow for the even distribution of users and to prevent local pressure building up. What is always missing in design criterion is an explanation of the problems associated with turnstile designs. This needs to be addressed both in a qualitative and quantitative process during the design phase as ingress routes, circulation routes and egress routes can all have hidden problems.

Some simple geometric rules can be applied to analyze the likely problems that might be expected along these routes. But, before this is done, it is important to clearly identify the problems associated with crowd dynamics and how they relate to entry routes. It is assumed that people will use the least effort to move from their present position to their next position.

Architectural Way finding

Architectural way finding focuses on way finding in built forms and urban settings because way finding strategies in natural outdoor settings are different (Golledge, 1999). The way finding ability of people varies with the visual clues received from the environment. Many physical and psychological factors influence perception in the environment such as the number of visual stimuli, the location, other occupants and the attentiveness of the occupants (Filippidis, et al. 2006). Architectural elements and finishing tricks in use of colour, materials, barriers, extended/freestanding walls/partitions as well as signs and graphical representations can be used to orient people by identifying and clarifying the type, location and routes for facilities and circulation visually. Consideration of way finding issues can highlight important clues about potential problems in space.

Most designers do not pay serious attention to way finding, seeing it as a hindrance to aesthetics or a problem to be solved with signage (Carpman and Grant, 2002). Given the impact of way finding on the psychology of human, occupant satisfaction, health, long-term performance, and the financial bottom line, inattention to way finding reduces the inclusiveness of buildings for everyone. The understanding of a few basic principles of architectural way finding design principles can help designers to enhance building performance and provide more inclusive solutions.

Figure 2: Legible circulation systems at the Guggenheim Museum, New York City.
Source: Carpman and Grant, 2002

Human and crowd behaviour

Human behaviour is difficult to predict and it is affected by many circumstances. Freedman (1975) points out that research on personal space is important from two points of view. First, it demonstrates that people do respond to variations in the space around them and have rules about what is appropriate. This makes it even more likely that population density affects people's behaviour in some way. Second, it shows that there are no absolutes involving this space. There is no right distance; there is no automatic negative or aggressive response when someone is close. Instead, the appropriate distance depends almost entirely on such factors as the relationship among the people, the setting, and the personal characteristics of those people. As Al-Gadhi (1995) argued in review study of Crowd Behaviour and Movement that "in general, observed variation in crowd behaviour may be attributed to variation in three factors: crowd characteristic, facility design and layout, and management practices. Moreover in the same review he explains that "these include but not limited to, the physical characteristics of the crowds and their movement, normal crowd dynamics and triggering mechanisms that transform normal crowds into potentially hazardous mobs.

Critical density is a point when there are more than 4 persons in one square metre. At this point, there is the potential for overcrowding and personal injury. It is therefore important to understand the dynamics of crowds. High density related to high spatial utilization has the highest probability of risk. How do crowds understand and interpret spaces they occupy? According to Still (2000), poor management and critical crowd density can lead at worst to crushing, injury and even death. (Still, 2004) in more specific analysis stated that ‘sometimes even small changes in the layout or venue, or a gradual increase in visitors, might lead to a disaster’. Moreover, in the same manner, Still explains that "in addition to the personal suffering such disasters cause, the accompanying adverse publicity, loss of revenue,

compensation payments, insurance costs and possible prosecution can have a long-term effect on a company's viability. This underscores the need for mass gatherings management and control of high density.

RESEARCH METHOD

The research method adopted to carry out this study was the post-occupancy survey research. An observation schedule was structured to evaluate the circulation safety features available in train terminal buildings. The assessment was in Nigerian cities currently served by train terminals. Six train terminals were selected at random from the eight terminals available in Nigeria by simple random sampling technique of the probability sampling method.

The selection of train terminals over train stations was based on the fact that lager population of passengers make use of the terminals as there are bigger infrastructures and by virtue of their location at the end of a rail line.

The data was collated and analysed using descriptive statistical tools such as mean, percentages and averages in a tabular format.

The six train terminals selected from the eight terminals currently available in Nigeria are tabulated in table 1.0

Table 1.0: Train Terminals Studied

Name of Terminal
Idu train terminal, Idu, Abuja.
RIGASA, Kaduna
Federal Railway Corporation, Jos Terminal
Federal Railway Corporation, Kano Terminal
Federal Railway Corporation, Lagos Terminal
Federal Railway Corporation, Portharcourt Terminal

Source: Authors' fieldwork, 2017

FINDINGS AND DISCUSION OF RESULTS

The results obtained through observation schedule were recorded in two categories. The first category investigates the availability of critical circulation features that are of necessity in train terminals while the second category is a measure of the extent to which certain circulation safety design features are incorporated in the studied facilities.

The first category was recorded using the following representations.

✓ - Available

• - Not available

The result in table 2.0 shows that all the terminals have an emergency exit which is required for the safe evacuation of the occupants of the facilities during a disaster. It also shows that 66.6% of the terminals have a clear space behind the exit points. This allows the spread of passengers as they exit the buildings avoiding the formation of crowd and bottle necks. Other safety features are however lacking in the studied facilities. Features such as an optional staircase at platforms and emergency staircase are available in only 16.6% of the terminals. The table shows also the extent to which each terminal has these passive safety features available in their designs.

Table 3.0 shows that crowd management personnel are available at the terminals to give instructions and directives regarding the movement and activities of passenger as they find their ways around the different functions. 66.6% had a signage system that shows the different functions and routes, 50% have the circulation paths defined using bars or chains. 16.6% however have an indoor public address system which is necessary for the passing of travel information.

Table 2.0; Passive circulation safety features.

Name of Terminal	Emergency Plat-Exits	Emergency behind Exits	Clear distance form Staircase	Optional Stair Case	TOTAL PER TERMINAL
Idu train terminal, Idu, Abuja	✓	✓	✓	✓	100%
RIGASA, Kaduna	•	✓	✓	•	50%
Federal Railway Corporation, Jos Terminal	•	✓	•	•	25%
Federal Railway Corporation, Kano Terminal	•	✓	✓	•	50%
Federal Railway Corporation, Lagos Terminal	•	✓	•	•	25%
Federal Railway Corporation, Portharcourt Terminal	•	✓	✓	•	50%
TOTAL PER FEATURE	**1**	**6**	**4**	**1**	
PERCENTAGE	**16.6%**	**100%**	**66.6%**	**16.6%**	

Source: Authors' fieldwork, 2017

Table 3.0; Active circulation safety features.

Name of Terminal	Indoor public Circula-Syst.	Signage ment personnel	Crowd Manage-tion pattern.	Defined address Syst.	TOTAL PER TERMINAL
Idu train terminal, Idu, Abuja	✓	✓	✓	✓	100%
RIGASA, Kaduna	•	✓	✓	✓	50%
Federal Railway Corporation, Jos Terminal	•	•	✓	•	25%
Federal Railway Corporation, Kano Terminal	•	•	✓	✓	50%
Federal Railway Corporation, Lagos Terminal	•	✓	✓	•	25%
Federal Railway Corporation, Portharcourt Terminal	•	✓	✓	•	50%
TOTAL PER FEATURE	**1**	**4**	**6**	**3**	
PERCENTAGE	**16.6%**	**66.6%**	**100%**	**50%**	

Source: Authors' fieldwork, 2017

The second category of the results obtained through observation schedule was analysed using pie charts to show the level of usage and availability of those indispensible features that are required for effective circulation. These elements under study are those always available in terminal buildings, but the level of their availability determines greatly the safety of pedestrians within the buildings. Chart 1.0 shows that 80% of the buildings are rectangular in their geometry as this allows the free and more convenient movement of people in and around of the buildings. Chart 2.0 shows that 67% of the terminals have 2 doors at the building entrance. 16.6% have over 5 doors while 16.6% have a single door. The number of doors available at the entrance determines how easily passengers gain access into the building. Inadequate number of doors creates crowd build-up and bottle necks.

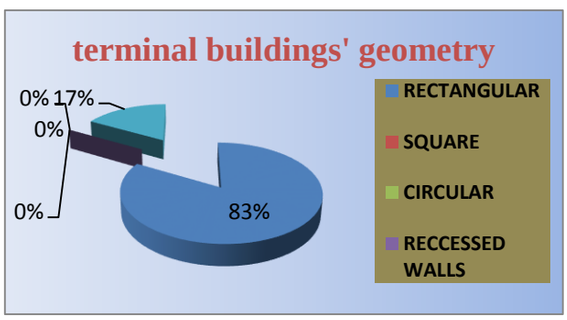

Figure 1.0; Geometry of the terminal buildings

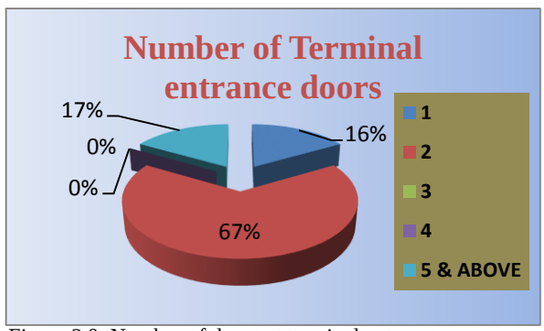

Figure 2.0; Number of doors at terminal entrance

The distance between a building's ingress and egress determines whether or not the people contained therein are well spread. When the entrance is quite distant from the exit as shown in figure 3.0, crowd build up becomes a difficult occurrence. 16.6% of the terminals have their ingress above 20 metres from the egress. However, majority which is 66.6% have the

ingress 10-20 metres from the egress. Figure 4.0 shows also the number of exit points in the studied facilities. 83.4% have 2 exit points separated from each other as this allows the spread of passengers within the space separating them. Only 16.6% have over five exit point from different points of the building.

Chart 5.0 shows the width of staircases which serves as the basic element for vertical movement especially at the platforms as well as the main halls. 75% of the terminals have their staircases between 1.2 and 1.8 metres wide while 25% are over 2.4m wide. The last chart which is figure 6.0 shows the width of the lobbies of the various facilities. 66.6% of the terminals having their lobbies ranging between 1.5 and 2.4 metres which aid free movement within the buildings. 16.6% however have their lobbies between 0.9 -1.5 and above 2.4 respectively.

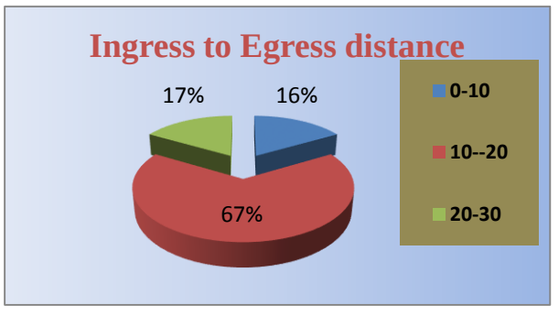

Figure 3.0; Distance between the terminals' ingress and egress

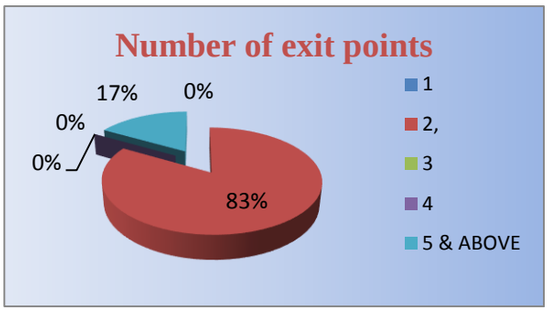

Figure 4.0; Number of exit points at the terminals

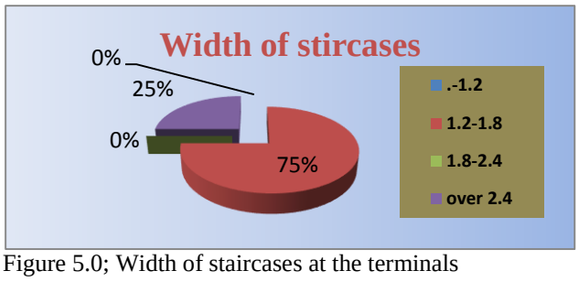

Figure 5.0; Width of staircases at the terminals terminals

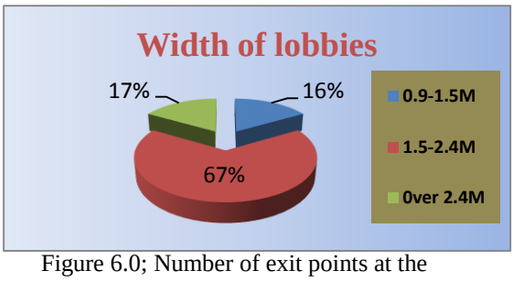

Figure 6.0; Number of exit points at the

CONCLUSION

The above analysis shows the safety level of Nigerian train terminals. It discusses the presence and extent of application of the various safety features. Table 2.0 shows that Nigerian railway terminals considers the need to move out its occupants in emergency events by making available emergency exits in all of the facilities. The terminals however lack emergency staircases at those emergency exits with its provision at 16.6%. This makes less effective the available emergency exits as they cannot be readily accessed from the floors above the ground floor. 66.6% of the emergency exits have a clear space behind them which allows for passengers free dissipation.

As discussed regarding table 3.0, Nigerian railway terminals adopt the active means of crowd management by means of crowd management personnel who control passengers' movement and activities physically thereby ignoring the use of public address system. The use of crowd management personnel have obviously side-lined the need for the passage of information via a public system. Some basic safety features of a terminal which are not available in the terminals render them low on the scale as the passengers will encounter difficulties to easily find their ways out at the platforms, locate the emergency exit from the floor above as well as get informed on the public state of services and the facilities in general.

It is also obvious that there is room for improvement on the available features of the terminals which would improve circulation safety. Features such as the distance between the terminal ingress and egress needs improvement as the majority of 10 – 20 metres seem too tight for the activities that are contained in a train terminal and could lead to crowd build-up and circulation crisis.

It is recommended therefore that an emergency staircase be provided near the emergency exits of the various terminals to make the functions of the exits effective. It is also needful that there is an optional staircase at each platform to allow the spread of passengers along the platforms. Improvement on the available features will also make safer the activities of users as the move between the various functions. Safety of pedestrians in train terminals should be a serious concern as the terminals and stations under the Nigerian Railway Corporation are been restored and new ones constructed.

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ASSESSMENT OF THE EXTENT OF TRAFFIC CONGESTION IN SELECTED TRAFFIC APPIAN IN MINNA, NIGERIA

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Traffic congestion has become a major challenge in major urban roads in Nigeria and Minna is not an exception to these challenges, which ranges from socio-economic to safety concerns on the lives of urban residents. This research therefore pursued the objectives of evaluating the nature of traffic congestion; assess the extent of congestion encountered in the selected traffic corridors; and analyse the impact of the congestion on urban accessibility in Minna, Nigeria. This research selected two major traffic corridors in Minna, which includes the primary apian that runs through the centre of the city which is the Suleja-Minna-Zungeru Road and the Western Bye pass. The research employs a comprehensive field survey and traffic count to analyse the nature of traffic, the extent of the congestion challenge and the various impact it poses to urban life in the selected corridors. The research findings show that, various peak and off-peak periods were identified at different times of the day, the traffic components identified in the selected corridors include cars, motorcycles, tricycles, and trucks. The research findings showed that the menace of congestion ranges from one osten point to the other on the selected traffic corridors. It is therefore recommended that, effective legislation and enforcement of traffic laws is required to deter some of the urban road users to comply with traffic rules must be put in Place and also raise the revenue base of the state government through surcharges and fines for traffic violations. Conclusively, it is quite pertinent to note that urgent attention should be focused on regulation the traffic situation in these selected corridors in order to attain sustainable urban transportation in the City.

Keywords: Cordon points, Traffic congestion, Traffic corridors, Traffic components, Sustainable urban transportation

INTRODUCTION

Transportation is inherently central to the development of nations, as it is not only a necessity of life but have a resultant effect on all aspects of human existence (Oyesiku, 2002). Oni (2004) described transport as the life wire of any urban environment. Without transport, life, as it is today, would be inconceivable; as it is central to the flow of knowledge, information and commercial goods (Oluwasegun, 2015). Transport is particularly crucial in the existence of a city and cities over the world remain the focal point in an economy where people come together primarily to exchange goods and interacts (Oluwasegun, 2015). Indeed, the transportation sector all over the world is generally recognized as being in a state of crisis, particularly, Nigerian cities have continued to expand in recent time and transport supply falls below the demand (Oluwasegun, 2015). The continued alarming growth of urban population is one of the major factors partly contributing to the rate of physical development in Nigerian cities (World Bank, 2006).Despite the opportunities, however, Nigeria is experiencing increasing rate of urban mobility problems (Oyesiku, 2002). Ogunsanya (1983) noted that urban transportation problem started with increasing urbanization leading to urban transport problems such as traffic congestion.

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According to the Joint Transport Research Centre of the Organisation for Economic Cooperation and Development (OECD) and the European Conference of Ministers of Transport (ECMT) in 2007, Cities and traffic have developed hand-in-hand since the earliest large human settlements (Fadairo, 2013). The same forces that draw inhabitants to congregate in large urban areas also lead to intolerable levels of traffic congestion on urban streets and thoroughfares (OECD, ECMT 2007). This captures the relationship between cities and traffic congestion as well as the world-wide dimension of the problem of traffic congestion in cities (Fadairo, 2013).

Traffic congestion is a major transportation problem of Nigerian cities. It occurs when urban road network is no longer able to accommodate the volume of traffic that uses them; it increases travel cost and causes physical and psychological discomfort (Jaco, 2008). The chaotic situation is observable in virtually all the road corridors in Minna Metropolis (Badamasi, 2014). Consequently, all over the major roads in Minna Metropolis, a large number of people and vehicles are seen crawling along the roads (Badamasi, 2014).

Minna the capital city of Niger State is largely populated because of the commercial activities going on within the town. Considering the fact that Minna is the capital, one should expect the influx of civil servants into the city. State and Federal Government workers within the state will most likely reside in the city for easy access to their different places of work. The 2017 projected population figure of Minna is 505,999 with growth rate of 3.4%.

The rapid increase in urbanization has a tremendous impact on the traffic system of cities in developing countries (Ogunbodede, 2003). According to the United Nation in 2012, the world population will reach 7.3 billion in July 2015 and that 83 million people will be added to the world's population at the end of 2016. This trend will continue because of the rapid growth in population, resulting from improvement in health services and the multifarious functions performed by cities, which have been another major attractive force. The situation as described above has its impact on traffic in the cities of developing world. Thus, the activities, which take place in them, make them generators and attractors of traffic, which, of course, has implications on mobility (Ogunbodede, 2003).

Urban areas have been noted to be very busy with automobiles, especially during the peak periods. During such peak periods, traffic noise comes from vehicle engines, exhaust systems and horns. Busy urban roads generate between 70-85 decibels of noise, depending on the characteristics of the traffic, speed and type of road surface (Ameyan, 1996). The tolerance level of noise is put at 66-68 decibels; meaning that with 70-85 decibels, a significant number of people are irritated and the negative effect of noise on health could be better imagined.

Illegal parking is also a contributing factor to this ugly trend. This is because of parking on roadside, which is a common phenomenon, reduces the traffic corridors meant for the efficient movement of automobiles. Thus, it becomes a major problem in cities and especially in the Central Business District (CBD), where multi-storey buildings are common and the land use is devoted mostly to commercial purposes (Ayotunde, 2013). The resultant effect of such illegal parking, therefore, is traffic congestion. This illegal parking leads to increase in travel time and increases the cost of traveling because more fuel is used up in the process of accomplishing a delayed journey (go-slow/traffic jam) (Ayotunde, 2013).

Traffic congestion is a major transportation problem of many Nigerian cities. If this is true then efforts will be geared towards cost-effective management of the problem (Ogunsanya, 2002). The findings from this study can provide independent information to guide the Federal and State governments, including concerned private companies and international agencies in responding to the challenges of traffic congestion in Nigeria. Besides, it will also trigger further studies in attempt to find solutions to the issues raised by this study.

Most of these identified traffic congestion related problems still persist in our cities of which Minna is no exception. This research therefore, addresses the problems of traffic congestion amongst selected road corridors in Minna metropolis.

Aim and Objectives

The aim of this study is to compare road traffic congestion along some selected major traffic corridors within Minna metropolis, Nigeria. The specific objectives are:

1. Identify the existing road corridors in Minna metropolis;
2. Classify the identified road according to hierarchy;

3. Carry out spatio-temporal analysis to ascertain the rate of congestion along selected road corridors; and
4. Evaluate the extent of congestion along selected road corridors;

Study Area

The study area is Minna which is the administrative capital of Niger State. Minna is in the middle belt of Nigeria, situated in the wet tropical or guinea climate in the guinea savanna zone. It extends on latitude 9º36'22"N and longitude 6º33'15"E. Minna lies on a valley bed (i.e. lowland) bordered to the east by Paida hill stretching eastwards toward Maitumbi and northwards to Maikunkele village, to the west and the southward is highland, with an area essentially savannah and quite conducive for farming. Minna falls under the tropical continental wet and dry climate based on the Koppen classification scheme. Hence it has a distinct wet season as well dry season. Minna is invaded by two distinct air masses, one from the north; dry and continental in origin, the Sahara air mass. The other is from the Atlantic in the south; moist cool and equatorial in nature. The weather depends to a large extent on the air mass which covers its area and depth. Annual rainfall distribution pattern shows a maximum of 130mm rainfall and minimum of 900-1000mm.the rainy season is between April and October covering a period of six months of September has the maximum rainfall.A monthly rainfall value in excess of 400mm occurs in Minna and its environs (Garber, 2002).

Landscape area of Minna is characterized by an undulating topography. The geological structure depicts steep sloping rock outcrop on the north and eastern flank. These rock outcrops (on the eastern flank); forms a physical constriction on the eastern flank. There are also large but isolated rock outcrops in this landscape and also some areas of scattered rocks. In other words, land beyond the presently developed strip is suitable for development but needs careful planning to keep engineering cost of converting, bridges, embankments and drainage works low to the north over the hills there are some developable lands but intersperse with poor land to the south the land offers reasonable development possibilities butt is curtailed by the Chanchaga river. There is a major drainage channel fed by many minor drainage flows from the Centre of the town south-west wards at some other locations, these drainage flood large areas of lying terrain especially after heavy downpour (Garber, 2002). Figure 1.1 and 1.2 shows Niger state in the national context and Minna in the state context respectively. Figure 1.3 shows Minna metropolis the study area.

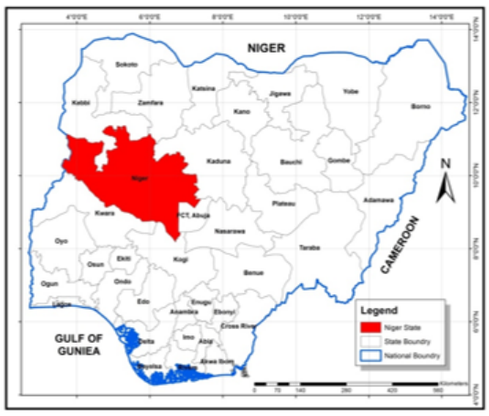

Figure 1.1: Niger State in the National Context
Source: Researcher's Modification, 2017.

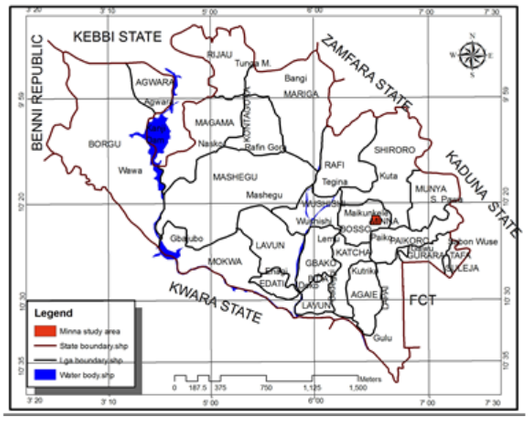

Figure 1.2: Minna in the State context.
Source: Researcher's Modification, 2017.

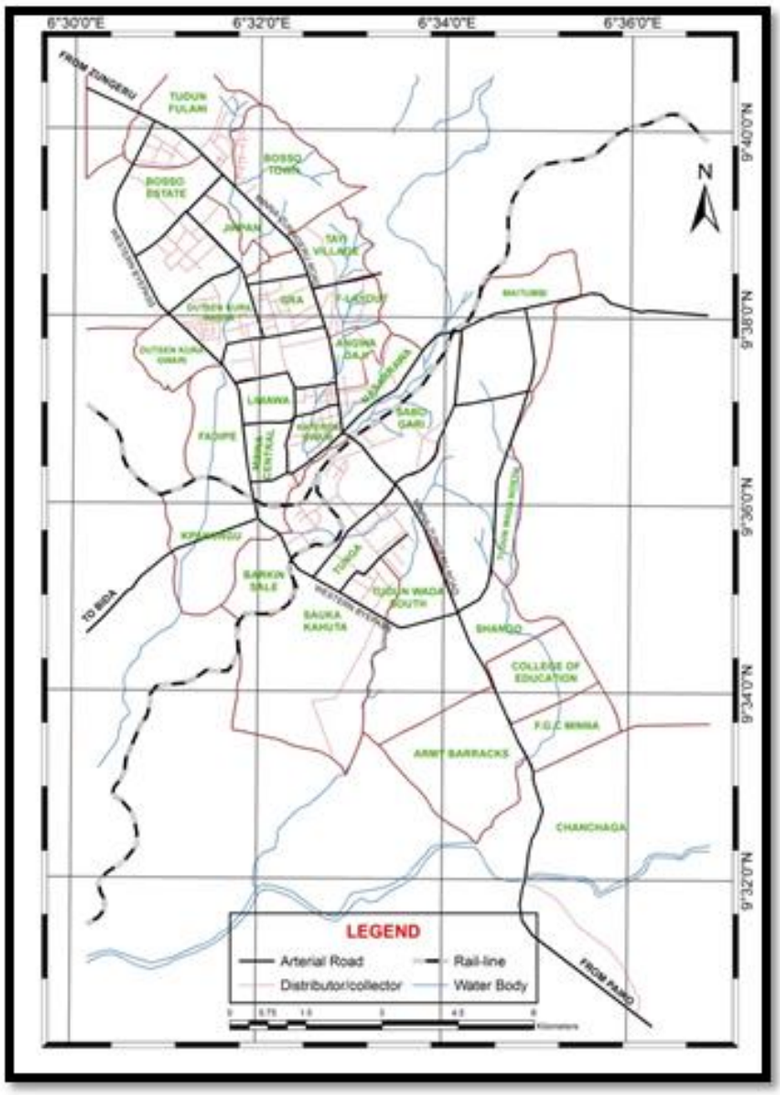

Figure 1.3: Minna Metropolis
Source: Ministry of Land and Housing, Niger state.

RESEARCH METHOD

The research design employed for the sake of this research is the survey research design and the cross-sectional research design. It explains the process of collecting data through conducting field survey and the use of instrument for on-the-spot collection of data for analysis. The materials that were used in achieving the aim of this research include high resolution Google Earth maps, ESRI ArcMap (10.1), a 12channel XL Garmin GPS receiver, a record sheet for recording volumetric count, a street map guide and internet sources for secondary data. As part of the method for data collection, a volumetric traffic count was embarked on to obtain spatio-temporal pattern of traffic over a selected period of time on the selected corridors in the metropolis from 6 a.m in the morning to 6 p.m in the evening at intervals of two (2) hours. The volumetric count examined traffic during selected days of the week. The volumetric count took note of traffic at the start of working days (Monday), during mid-week (Wednesday), the end of working days (Friday) and then a weekend (Saturday). This helped establish the peak periods of each corridor studied. At the various selected corridors, research assistants were positioned within the specified time frame to help with the traffic count. Traffic component counted during the volumetric count were; cars (private cars and taxis), motorcycle, tricycle, buses (mini-buses and luxury buses), trucks/trailers/vans and bicycles. A record sheet was used in the field to collect the volumetric count data after which they will be checked, edited and integrated for analysis. Table 3.1 shows the volumetric count table format adopted for the sake of this research.

All responses to the research data collection instrument and materials were checked and edited. Descriptive analysis of the volumetric count conducted was performed by means of frequency distribution and percentages, the result of which was presented using graphs, charts and tables. Microsoft Office (Excel and Word) was used to aid analysis. As part of the research process, inputs from volumetric count were organized comprehensively and analysed geo-spatially using ArcMap. The advancement in GIS enhances analysis and allows swift interpretation for better policy making. In Geographic Information System (GIS), there is a wide variety of data source, though all fall into two categories; primary and secondary data sources. For the sake of this research, data used in the Geographic information system are primary in nature. They include the high resolution satellite image captured from Google Earth viewer, the Street Map Guide from Niger State Ministry of Land and Housing which was geo-referenced and digitized, and volumetric count data collected during the field survey. These entire data sources aided the generation of attribute data. The attribute data are been stored in a relational structured format often characterized by a collection of tables relating object to their properties.

Analysis of the road traffic network of Minna Metropolis was developed showing the position of the Arterial roads and Distributor/Collector roads within the study area, road related attribute data will also be generated through analysis of the road network which will also help check the possibility of an alternative route. Attribute data generated via analysis will also show road networks with different congestion levels and hot/cordon points by congestion in the study area. The extent of congestion was measured via the aid of a buffer analysis in the GIS environment. A buffer analysis was established using the volumetric count of each peak periods of the day along the corridor studied. The lengths of each of the corridors were ascertained through a road network statistical analysis on ArcGIS. Thus aided measuring the extent of congestion especially during the peak hours of the day, the overlapping technique in ArcGIS was used to compare the trend of extent for different days of the week studied.

RESULTS AND DISCUSSION

Mapping of Selected Road Corridor

This research is primarily confined to selected road corridors characterised by the disturbing menace of congestion. Road hierarchy was used as a basis for the selection of these corridors. For the sake of effective and reliable analysis, road corridors of the same hierarchy were selected and compared. On a hierarchy based classification, Minna road corridor is classified into three broad types namely; the Arterial road, the Distributor/Collector road and the Access road. Statistics from the Federal Road Safety Commission (FRSC) in 2016 revealed that the two apian that runs through the centre of metropolis suffers major crisis resulting from the menace of congestion. This served as a basis for selecting the corridors for study.

Volumetric traffic count along corridor A (Western By-Pass carrying streams of traffic from Bosso, Dutsen Kura Hausa and Dutsen Kura Gwari to Kpakungu) Figure 4.2 summarizes the traffic distribution for the observed days of the week along the corridor under study. The most noticeable congestion problem along the study corridor was during the peak hour (between 8:01 am and 10:00 am) while coming from Bosso, Dutsen Kura Hausa and Dutsen Kura Gwari. This is because of the concentration of individual workers that leave for work during the morning and staffs and students of the Federal University of Technology Minna who have activities to engage in at Gidan Kwano campus. The type of congestion experienced during this period is the synchronized-flow congestion characterized with significant drop in the speed of vehicles with no noticeable change in the flow rate.

It could be deduced from figure 4.2 that the two peaks periods were constant for all the days of the week observed. The hours of the day associated with the peak periods are from 8:01 am – 10:00 am (morning Peak) and 2:01 pm – 4:00 pm (evening peak). This however is in line with the reality of two peak periods of congestion. Figure 4.3 reveals that traffic is at its highest on Monday. The implication of this is that it leads to the clogging of the corridor which often leads to terrible traffic on Monday. This is justified by the fact that Monday is the first day of the week.

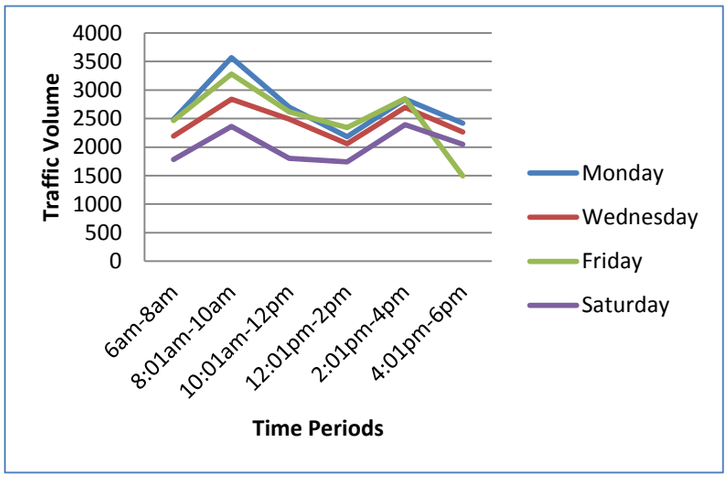

Figure 4.3: Percentage Composition of Traffic for the observed days of the week along corridor A.
Source: Field Survey, 2017

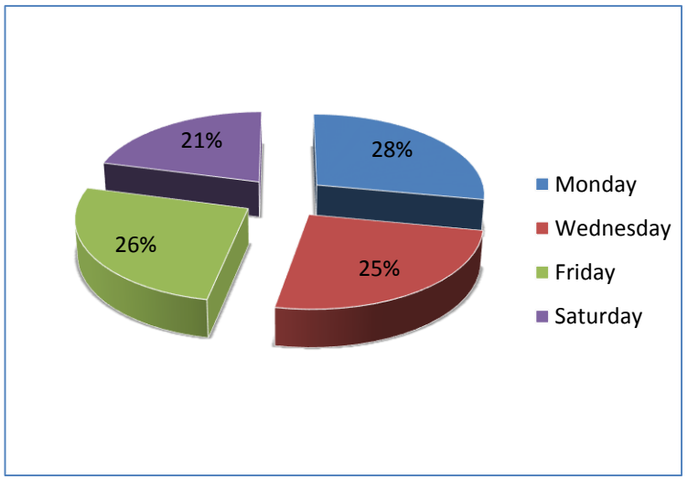

Figure 4.2: -Traffic distribution for the observed days of the week along corridor A.
Source: - Field Survey, 2017

Volumetric traffic count for Monday along corridor B (Western By-Pass carrying streams of traffic from Tunga, Sauka Kahuta and Barkin Sale to Kpakungu)

Figure 4.4 summarizes the traffic distribution for the observed days of the week along the corridor under study. It could be deduced from figure 4.4 that the two peaks periods were constant for all the days of the week observed. The hours of the day associated with the peak periods are from 8:01 am – 10:00 am (morning Peak) and 2:01 pm – 4:00 pm (evening peak). This, however, is in line with the reality of two peak periods of congestion. During the peak periods when traffic was intense, traffic congestion was noticed in numerous cases. Contributing factors to the congestion situation along the corridor were grocery stores and shops that are juxtaposed to each other without provision for parking resorting to roadside parking by vehicle drivers alongside petty traders who lay their commodities for sale along the shoulders of the corridors resorting to customers parking on the roadside which obstructs traffic.

The type of congestion experienced during this period is the synchronized-flow congestion characterized with significant drop in the speed of vehicles with no noticeable change in the flow rate. In was observed during the study that elementary school students plied through the corridor frequently on bicycle as a mode of transportation to their schools. This is responsible for the significant up-rise in the bicycle traffic along corridor B as compared to corridor A. This is justified by the current location of the Limawa Government Secondary School along the western by-pass.

Figure 4.5 reveals that traffic is at its highest on Monday with 29% of the entire traffic for the days observed. This, however, leads to the clogging of the corridor which often leads to terrible traffic on Monday.it could also be ascertained from the figure that traffic gradually falls progressively from the start of working days (Monday) to weekend (Saturday).

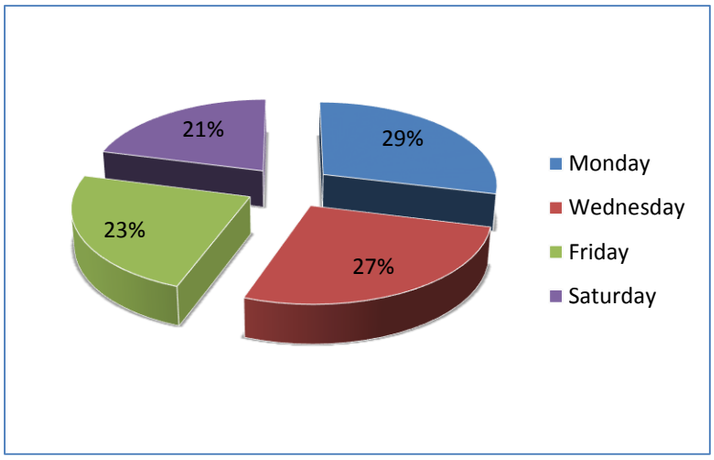

Figure 4.4: Percentage Composition of Traffic for the observed days of the week along corridor B.
Source: Field Survey, 2017.

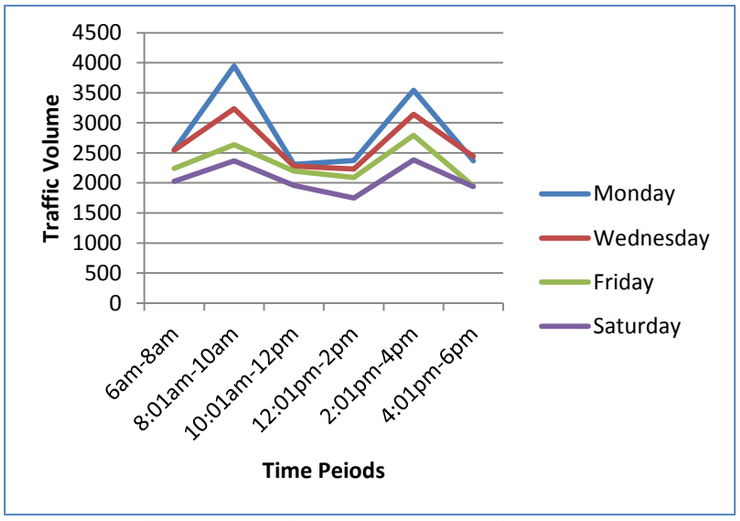

Figure 4.5: -Traffic distribution for the observed days of the week along corridor B.
Source: - Field Survey, 2017

Volumetric traffic count along corridor C (Minna-Zungeru road carrying streams of traffic from Chanchaga, Tunga and Shango to Mobil)

Figure 4.6 summarizes the traffic distribution for the observed days of the week along corridor c. The most noticeable congestion problem along the study corridor was during the peak hour (between 8:01 am and 10:00 am) while coming from Chanchaga, Tunga and Shango. During the peak periods when traffic was intense, traffic congestion was experienced in numerous cases. Congestion during this period could be attributed to absence of lay-bays at the shoulders of the corridor to allow for on-street parking. Thus vehicle owners resort to parking along the road just before the cordon point which obstructs traffic. The type of congestion experienced during this period is the synchronized-flow congestion as experienced on previous corridors examined characterized with significant drop in the speed of vehicles with no noticeable change in the flow rate. In could be said from the figure that peak periods did not follow the same trend as seen in the previous corridors examined. Peak periods during the week occurred between the hours of 8:01am-10: 00 am for the morning peak, 2:01pm-4: 00 pm and 4:01pm-6: 00 pm for the evening peak.

Figure 4.7 reveals that traffic is at its highest on Monday with 29% of the entire traffic for the days observed. This, however, leads to the clogging of the corridor which often leads to terrible traffic on Monday.

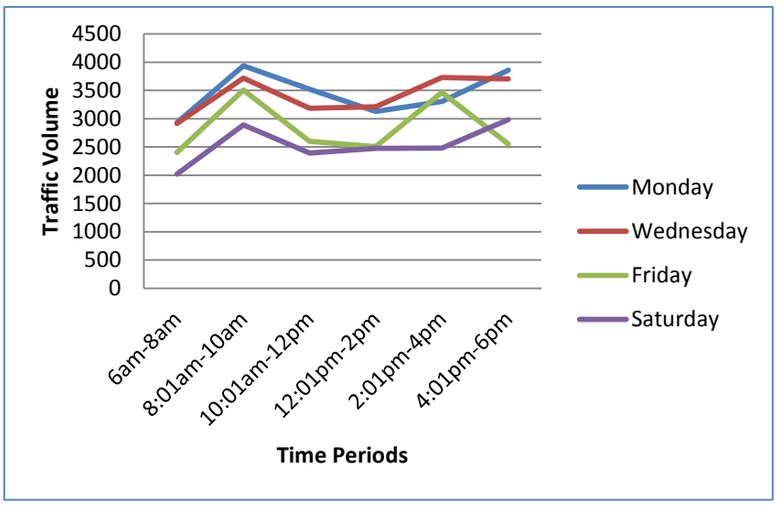

Figure 4.6: Percentage Composition of Traffic for the observed days of the week along corridor C.
Source: Field Survey, 2017

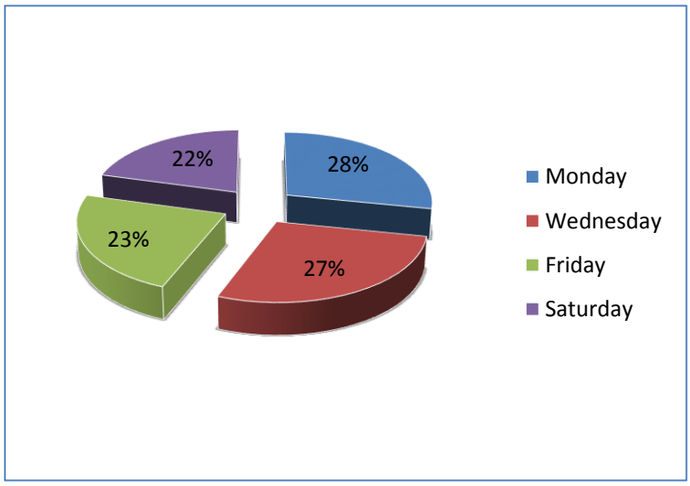

Figure 4.7: -Traffic distribution for the observed days of the week along corridor C.
Source: - Field Survey, 2017

Volumetric Traffic Count along Corridor D (Minna-Zungeru road carrying streams of traffic from Bosso, Tayi village and F-Layout to Mobil); Figure 4.8 gives a summary of the traffic distribution along corridor D during the observed days of the week. It also presents the trend in peak periods and off-peak periods. Just like in previous corridors examined, the most noticed congestion period was during the morning and evening peak hour (between 8:01 am – 10 am and 4:01 pm – 6 pm) while coming from Bosso, Tayi village and F-Layout. During the peak periods when traffic was intense, traffic congestion was experienced in numerous cases. Contributing factor to the congestion along the corridor were petty traders who lay their commodities for sale along the shoulders of the corridor resorting to vehicles (commercial taxis and tricycles in particular) parking on the road side which obstructs traffic. The corridor runs through the central business district of the metropolis and as such traffic is intense because of the various land uses that generates and attracts traffic within the central business district. The available right of way for traffic is very small considering the nature of traffic in the CBD and as such various transport vessels compete for the available space especially during intense traffic period.

Figure 4.9 reveals that traffic is at its highest on Monday and least on Saturday. This is justified by the fact that Monday is the first day of the week and economic activities are vibrant a case of which is different during weekends. This, however, leads to the clogging of the corridor leading to terrible traffic on Monday the case of which is different on Saturday characterized by very smooth traffic flow.

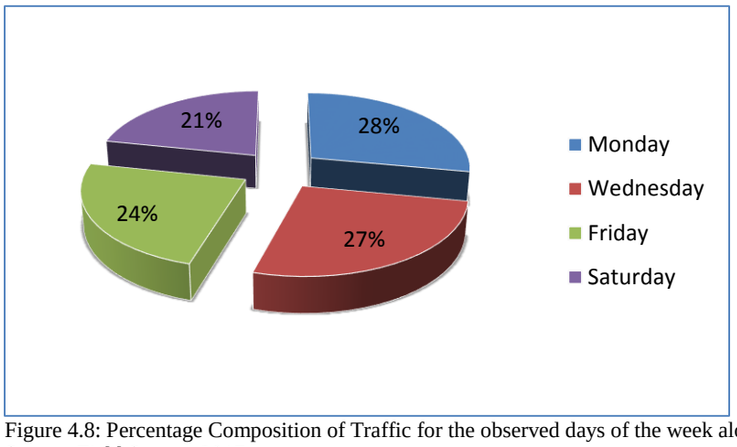

Figure 4.8: Percentage Composition of Traffic for the observed days of the week along corridor D.
Source: Field Survey, 2017.

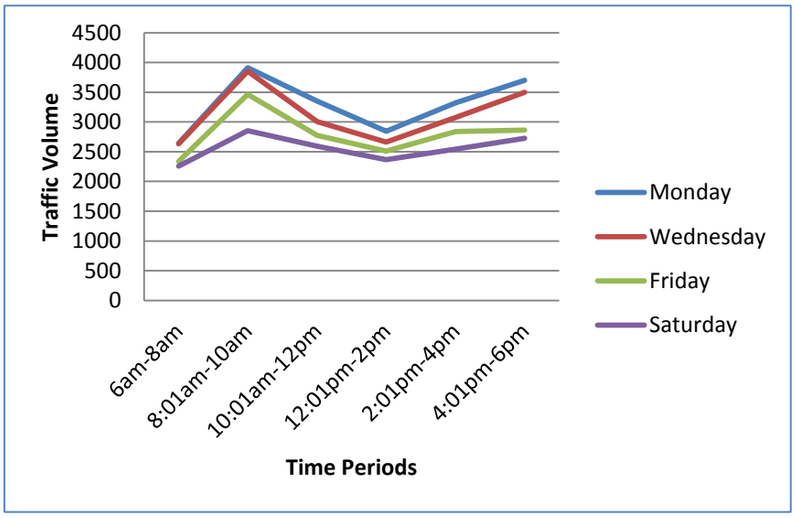

Figure 4.9: -Traffic distribution for the observed days of the week along corridor D.
Source: - Field Survey, 2017.

Comprehensive Traffic Volumetric Analysis in the Selected Research Road Corridors

	Corridor A						Corridor B						Corridor C						Corridor D					
Days of the Week	C	T	B	TT	M	B	C	T	B	TT	M	B	C	T	B	TT	M	B	C	T	B	TT	M	B
Monday	6286	3263	66	36	6535	9	6374	4236	48	26	6392	10	7404	5603	90	97	7442	47	6627	5432	89	88	7494	44
Wednesday	5748	2976	35	25	5764	4	5748	4212	49	47	5806	12	7596	5668	66	67	7036	30	6394	5430	96	81	6696	37
Friday	5501	3611	46	39	5852	12	4971	4040	56	44	4772	17	6001	4608	93	60	6256	24	6042	5150	67	71	5420	43
Saturday	4227	3138	24	41	4699	3	4365	3357	35	37	4621	18	5248	4195	65	50	5679	9	5094	4802	68	61	5294	28

Legend	
C	Cars
T	Tricycles
B	Buses
TT	Trucks/Trailers
M	Motorcycles
B	Bicycles

Source: Author's Research, 2017

Congestion Extent Experienced along Corridors Studied.

The extent of congestion was extreme during certain peak periods of the day. A composite map that shows all the extent of congestion experienced during the days of the week along the corridors studied is seen in figure 4.10. The extent of congestion for each day of the week studied along the corridor is represented by different colour tones. The direct correlation between the colour tones and the extent of congestion tells that the denser the tone, the more extreme the extent of congestion experienced. The overlapping technique in ArcGIS was used to arrive at the map composite. The congestion extent of each day of the week studied was overlapped accordingly to reveal the trend.

Figure 4.10 reveals that the extent of congestion along each of the corridors examined is extreme on Mondays. The implication of this is that there will be clogging of road corridors on Monday which will often lead to terrible traffic on Mondays. The trend falls concurrently all through the week along the corridors leaving Saturday (a weekend) with the least extent of congestion. The extent of congestion is least on Saturdays all through the corridors

justified by the fact that economic activities are not as vibrant as they are during weekdays. This explains the reason for smooth traffic flow during weekends.

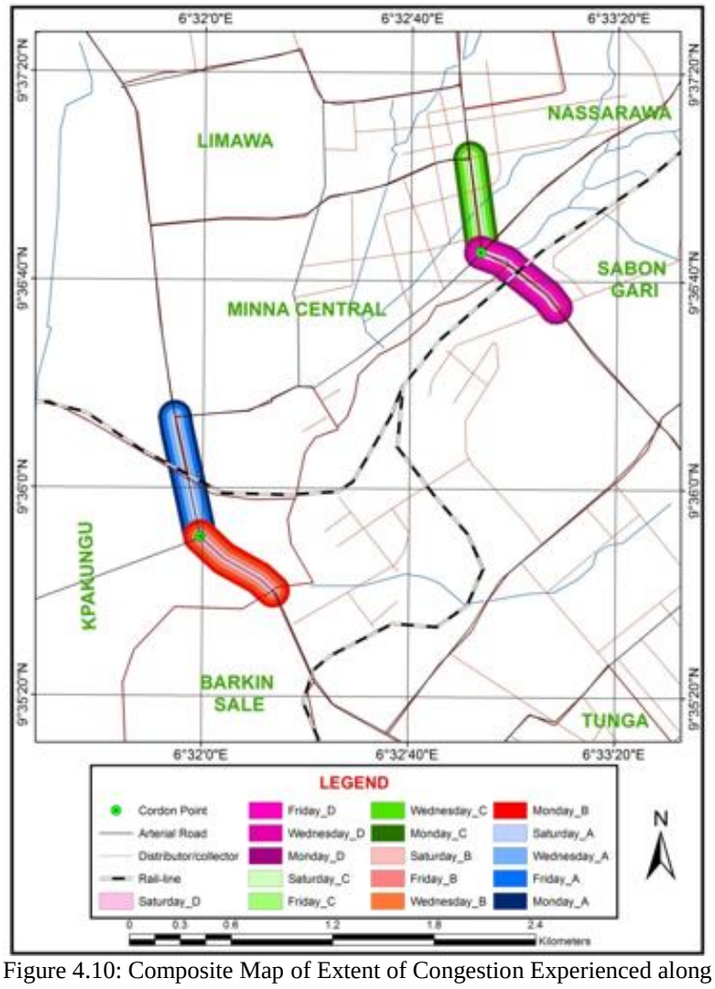

Figure 4.10: Composite Map of Extent of Congestion Experienced along Corridors Examined.
Source: Field Survey, 2017.

CONCLUSION

The conclusion for this research work is based on the research findings. Transportation is a basic tool, vital to the effectiveness and smooth running of every single human activity. Consequently, it is most appropriate that significant effort is adapted towards guaranteeing its greatest practicable usefulness (Badamasi, 2014). This study has been able to identify the nature, impact and extent of traffic congestion on urban accessibility in Minna metropolis and offered some useful suggestions on ways and means to solve these problems.

Although the congestion issues in Minna has not yet assumed the dimensions of that of larger cities like Abuja, Lagos, Ibadan and Port-Harcourt, signs of bottlenecks are already apparent. With increasing population growth and affluence, it is expected that the situation will deteriorate much sooner unless we evolve efficient traffic management for our cities, especially at traffic intersections.

Conclusively, it is quite pertinent to note that urgent attention should be focused on regulating the traffic situation in these selected corridors in order to attain sustainable urban transportation in the City.

Recommendations

Traffic congestion problems are huge impediments to the free flow of traffic. These problems are caused by the growth in the number of vehicles on the roads, occasioned by population growth, as well as ineffective use of the road spaces (Aderamo et al., 2011). In lieu of the research findings, the following recommendations have been proposed in order to effectively deal with the problems of traffic congestion in the study area:

1. The narrowness of the corridors do not give ample space for side-kerb parking and due to the absence of a provision for off-street parking, drivers resort to parking on the streets, thereby, further constricting the already narrow carriageway. It is therefore

recommended that the expansion of the carriageway, the provision of off-street parking facilities as well as the installation of NO PARKING and NO WAITING signs strategically, will alleviate the problem of on-street parking (Aderamo et al, 2011).

2. There is also the need to ban, in all its forms, illegal commercial activities being carried out along and around the road corridor as it generally constitutes a nuisance and an impediment to the free flow of traffic.

3. Analysis of traffic congestion along the study corridors revealed that poor driving habits of road users contributed to the menace of congestion experienced along the corridor. On this note, authorities of urban road transport in the metropolis should embark on regular education campaign to sensitize the road users on effective utilization of roads.

4. The use of mass transit has an advantage in moving more people than cars and motorcycles. In addition to this, the space occupied by smaller vehicles will be well reduced, if larger buses are patronized. The incorporation of mass transit lanes on highways will also help in easing congestion.

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SPATIAL ANALYSIS OF ON-STREET PARKING IN KPAKUNGU AREA OF MINNA, NIGERIA

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On-street parking overtime has taken a spatial dimension and become widespread in most urban areas of Nigeria, increase the time taken to places of work, homes and playing areas, invariably affecting the economic time at the larger scale. This research, therefore, aims at analyzing the spatial dimension of on-street parking and its economic impact on the primary Appian along Minna-Kpakungu-Bida area of Niger State. The research adopted both empirical and survey research design in order to achieve the aim of the research work. The empirical data were obtained using a structured questionnaire, while, a comprehensive on-street parking count at various hourly intervals between 8 am and 6 pm was carried out. The researcher observed that various peak and off-peak periods existing in terms of on-street parking in the survey area. The first peak period is found to be between 9 am, and 11 am in the morning which signifies the rush-hour traffic and parking first noticed in the daytime, another peak period was observed between 12 mid-day and 2 pm and the third peak between 6 pm and 8 pm. Furthermore, the research showed that the continuous on-street parking in this area has continued to affect the economic prosperity of residents around this area. While some residents agreed that most of the on-street parkers have come for one form of business or the other, others opined that such parking has continuously affected trading and commercial activities in these traffic zone. The researchers therefore, recommended an immediate relocation of all the motor parks along this traffic zone and enacted laws regulating on-street parking along this traffic zone. In conclusion, therefore, a concerted effort is required to urgently mitigate the negative economic impact of this scenario of on-street parking in the area.

Keywords: *On-street Parking, Traffic Zone, Appian, Economic Impact; Urban area*

INTRODUCTION

An integral part of the transport system which plays a crucial role in the management of traffic and congestion is parking (Allison, 2002). The urban growth in terms of population increase and the spatial expansion of the urban centers which come along with the increase in car ownership and increase in demand for movement for employment, leisure, education and other urban activities (Osoba, 2012). Accordingly, some cities cannot cope with the massive growth in the number of people due to urban activities, especially at the urban centers. The situation is getting worse with the growing population of visitors due to urban revitalization, suburban development and the increasing trend of mobility which makes parking situation more challenging. Therefore, parking is increasingly given attention as an important element of transportation planning (Jeffery, 2007).

Parking is a critical component of transportation policy and management for any place. The policies and management practices affecting parking lead to outcomes that can affect land use, air quality, traffic congestion, travel behavior, safety and economic development. For instance, policies that provide a large amount of on-street parking may encourage automobile use, therefore increasing congestion (Allison, 2002). As important as parking is, there are relatively few serious analyses and assessments of parking and even fewer of on-street parking.

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Medayese et al., (2018). **SPATIAL ANALYSIS OF ON-STREET PARKING IN KPAKUNGU AREA OF MINNA, NIGERIA.** Contemporary Issues and Sustainable Practices in the Built Environment. School of Environmental Technology Conference, SETIC, 2018

The interplay between on-street parking and other objectives such as land use or economic developments is not well understood, policies are sometimes misguided and opportunities are missed to utilize parking in ways that could have positive impacts. Parking is one of the experiences that people have when traveling and it plays an important role in traffic management and traffic congestion as it is generally recognized that city centers depend on a rapid turnover of parking to meet the demand for a short-stay visit (Asiyanbola and Akinpelu, 2012). Parking and traffic congestion are synonymous with each other because failure to meet parking demand of the people in a city leads to on-street parking that results in traffic congestion. It plays a crucial role in the management of traffic and traffic congestion (Allison, 2002). On-street parking forms one major problem that makes traffic conditions chaotic in Nigerian cities (Asiyanbola and Akinpelu 2012). The problem of on-street parking in Nigeria is that most roads in Nigerian cities are narrow thereby causing traffic congestion. This is due to the inadequate off-street parking facilities along transportation routes couples with poor traffic management (Olorunfemi, 2013).

On-street parking refers to the parking space made available along the curb of a street or road that are designed to accommodate vehicles. If a city provides on-street parking, especially in commercial areas, it makes conscious choices to provide better access to adjacent land use at the expense of more efficiently moving traffic (Olorunfemi, 2013). Richard and David (2007) opine that on-street parking affects the traffic movement in three ways; it reduces the street's capacity, it reduces safety on the road and increases service conflict.

On-street parking is an important factor in promoting business in cities, especially within central business districts. On-street parking provides easy access to businesses located on city streets and occupies less land space than off-street parking. On street parking is an efficient means for allowing multiple users to use the same space at different times to reach multiple destinations. On-street parking creates a barrier between moving traffic and individuals walking on the sidewalks, providing a measure of safety and reducing the level of perceived noise for pedestrians (Edwards 2002).

Despite the importance, on-street parking also has its downside. The same barrier between moving traffic individuals on the sidewalks can create a visual obstruction for pedestrians to cross intersections and vehicles moving along the street, thus increasing accidents. On-street parking also competes with other uses of roadways, including additional lanes for traffic flow, bike lanes, and wider sidewalks. Also, as drivers search for open spaces, congestion on roadways is increased. Lastly, on-street, like all forms of parking, attracts vehicles which increase traffic.

Parking is essential to ensure people have access to goods and services, which they need. It plays a significant role in city's economy. Parking becomes a necessity when one recognizes the fact that urban centers are characterized by interrelated and complex land use activities which require well-planned and efficient performance of the transportation system. Buses, trucks, and cars move goods and passengers in and out of cities on a daily basis. The way cities are organized constitutes a potential for increasing demand for motor-based travel (Akinpelu and Asiyanbola, 2012).

One major objective of transportation planning is to ease the movement of passengers and goods on urban roads. However, in many towns and cities all over the world, there is an undesirable degree of traffic congestion on urban roads. The provision of new roads is often expensive and most municipal government usually considers the option of widening existing roads which involves the destruction of houses and properties in the area. But the widening of roads and destruction of buildings are not necessarily the solution needed in controlling traffic congestion on our roads (Akinpelu and Asiyanbola, 2012).

Unlike other urban problems, the crisis in urban transportation rapidly manifests itself in congestion, delay, crash, parking difficulties and environmental pollution. Ayeni (1983) described these as the most pressing and most visible urban problem of Nigeria cities. Oduola (1981) explained that most urban congestion problems are caused by the less than the optimal manner in which the roads are used. Roadside and on-street parking, roads side trading and total disregard of traffic regulation by road users are a significant human contribution to the traffic problem.

According to Simmon (1996) in the developing countries, parking is a complex and long-term problem which cannot be totally eradicated but managed. Buses and trucks have to load and unload passengers and goods. They all need space to park and this poses a problem if

required spaces are not available. From the above, it is seen that the usage of a vehicle has a direct linkage with parking. This is because after the vehicle is driven to a destination, its usefulness greatly diminishes if there is difficulty in parking. To be effective, therefore, transportation system must include adequate parking facilities in all places that attract vehicle traffic. The research on the impact of on-street parking on traffic shows that on-street packing has socio-economic and environmental benefits as well as challenges, but these are yet to be worked on in Kpakungu. The aim of the study is to analyse the impact of on-street parking on traffic in Kpakungu, Minna; the objectives that would be carried out for the success of this project are to:

i. Examine the various land uses along the major road corridor (minna-bida apian);

ii. Assess the various parking facilities and determine the status of the parking facilities;

iii. Investigate the condition of the parking facilities;

iv. Evaluate the prevalence of on-street parking; and;

v. Interrogate the causes of on-street parking;

Study Area

This study is restricted to Kpakungu neighborhood in Minna, Niger state. The research is based on the disturbing effect of on-street parking on traffic and other land use in Kpakungu. The scopes of this research are to identify the causes of on-street parking, identify the contribution of on-street parking to traffic congestion. It also entails examining the extent on-street parking has affected traffic flow in Kpakungu. The findings of the research bring ideas of necessary recommendations needed to battle the problems then the conclusion of the research. The study area will be Kpakungu Minna Niger state which covers an area approximately 114 hectares and is located on latitude 90 35'55.00"N and longitude 60 32' 00.00"E with a population of 28,924. Kpakungu is one of the wards in Minna with the following ethnic groups: Nupe, Gwari, Yoruba, Igbo, Hausa, and Edo. Kpakungu is dominated mostly by the Nupe and Gwari people who engage themselves mostly with agricultural activities. Kpakungu which is one of the oldest wards in Minna has increased with a growing number of people embarking on the neighborhood.

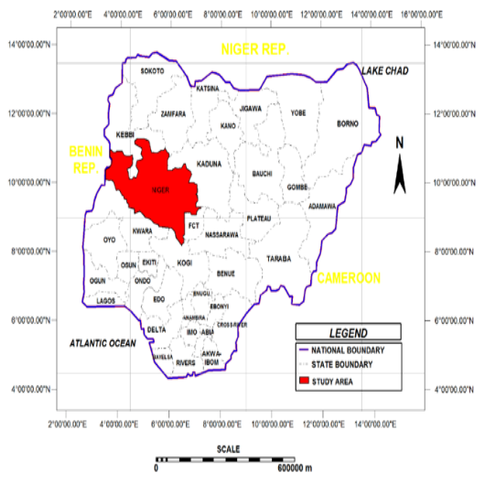

Figure 1: Niger state in the National Context
Source: Ministry of Lands Niger State (2017)

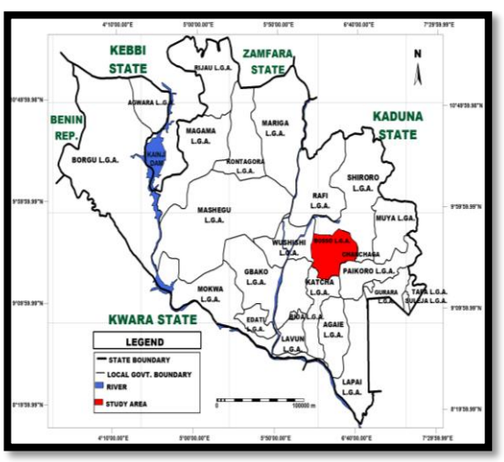

Figure 2: Administrative Delineation of Niger State
Source: Ministry of Lands Niger state (2017)

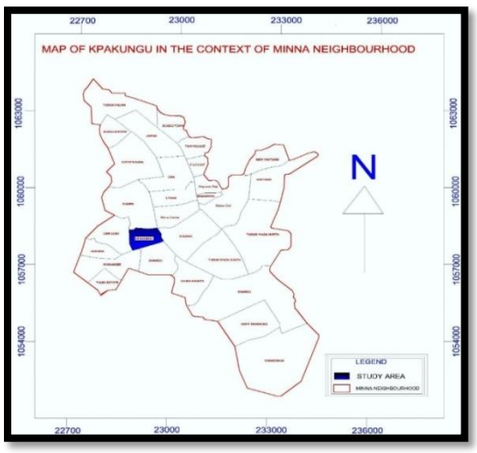

Figure 3: Minna Neighbourhoods showing Kpakungu

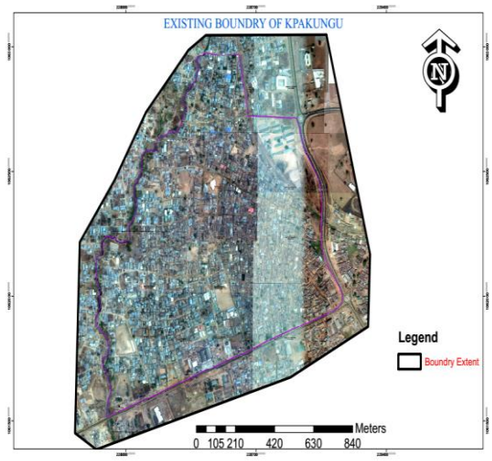

Figure 4: Boundary of Kpakungu

RESEARCH METHOD

Survey research was carried out to ensure the appropriate result for the analysis of the impact of on-street parking in Kpakungu. The research involves cross-sectional research. Distribution of questionnaire to different households to obtain adequate data to quantify the impact of on-street parking on traffic in Kpakungu. The questionnaire aimed towards answering traffic and on-street parking related questions. The questionnaire gives the provision of on the spot data collection. It also involves using physical observation and oral interviews to acquire data. Parking survey would be carried out over a period of one week. The continuous inspection of the cars parked along Kpakungu and also the time interval. It will provide information for the peak periods in which the cars are parked and also information for when on-street parking is at the minimum.

Random sampling will be adopted for this research. In order to achieve the objectives of the research, Table 1 shows the objectives of the research, data required for each objective, the instruments and methods of collection as well as the method of data analysis. The empirical research will provide for the researcher the opportunity to assess the impact of on-street parking on traffic in Kpakungu.

Table 1: Summary of the Research Methodology

S/N	Objectives	Data required	Instrument and method of data collection	Method of data analysis
1	Examine the various land uses along the major road corridor (Minna-Bida Apian)	Secondary data	• Spatial mapping using GPS	Map
2	assess the various parking facilities and determine the condition of the parking facilities	Primary data Secondary data	• Physical observation recorded during researchers field work • Questionnaire administration	Table Graph
3	evaluate the prevalence of on-street parking	Primary data Secondary data	Parking survey census will be conducted during selected period	Table Graph
4	interrogate the causes of on-street parking.	Primary data	• Questionnaire administration	Table Graph

Source: Author's research work (2017)

RESULTS AND DISCUSSION

Mapping of the land use along the major road corridor

This research is based on Kpakungu road corridor along Minna-Bida road which is characterized by the problem of on-street parking leading to traffic congestion. The land use along the road corridor is mainly commercial which is represented in figure 4.1.

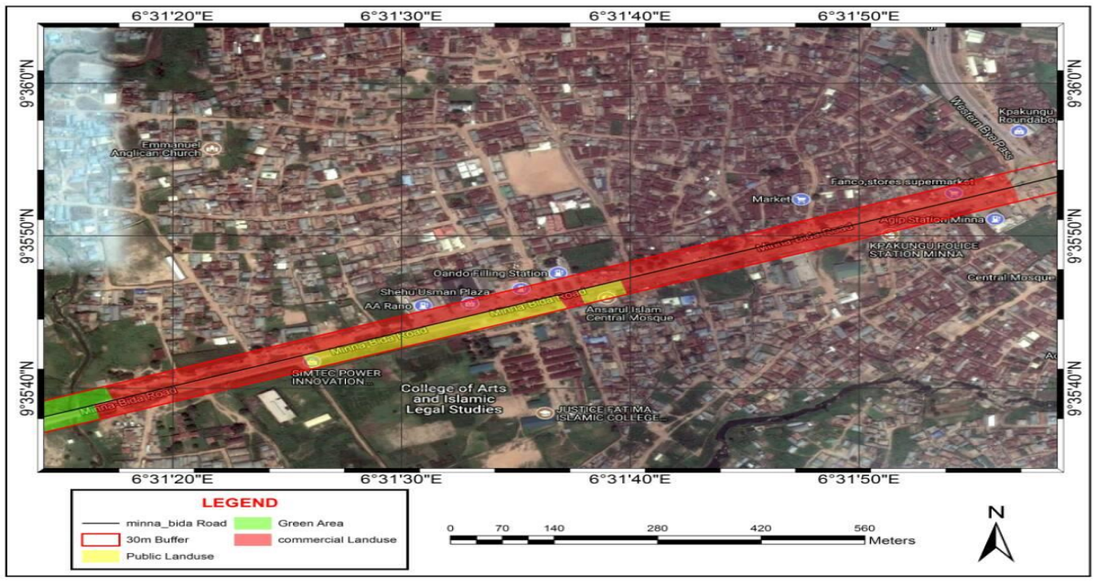

Figure 5: showing the google earth image of the existing land use of the study area
Source: Author's work

Assessment of the parking facilities and their condition

Among the objectives of this research is the assessment of the parking facilities and the conditions of the parking facilities. In the course of the research, it was noticed that parking facilities are provided for the business owners but a provision was not made for the customers in some business areas. A survey was carried out to show the business areas with parking facilities provided for the business owners and customers and also areas with parking facilities provided for only the business owners. Figure 4.2 shows the percentage of businesses with parking provided for the customers and the business areas without the provision of parking facilities.

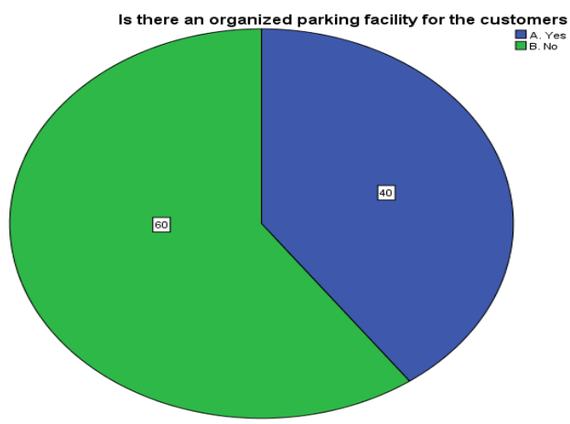

Figure: 6: The percentage of business with parking facilities for the customers
Source: Field Survey, 2017

40% of the business in the area is provided with parking facilities for the customers while 60% of the business does not have provision for the customers. It was understood that some business areas were provided with parking spaces but the spaces are now rented out to small retail business which now forced customers to park on the street. Upon further research, it was understood that these retail business owners were approved by the government. So the government is the contributing factor for the condition of the parking facility been abused. In those areas with retail business in front of the already established business areas, business owners are also forced to park their cars on the street. Different commercial transport agencies in the area were also analyzed and also their parking condition. The condition of the car park of the commercial transport workers within Minna i.e. the Niger State Urban Transport Workers (NURTW) is not suitable. There are no available car parks for these commercial transport users and they are forced to park in front of business areas and also get their customers parked on the street. A survey was carried out to know the condition of the facilities of the car parks provided for the road transport workers. Figure 6 shows the condition of the facilities provided for the car parks.

Though different facilities were provided for the transport union, there is no proper maintenance of these facilities. 48% agreed that these facilities are bad and either needs to be replaced or properly maintained. It was understood that there is no proper maintenance team allocated for the facilities this is shown in Table 2.

Table 2: The condition of facilities in the car park

	Frequency	Percent
Very good	8	13.3
Good	1	1.7
Fair	11	18.3
Bad	29	48.3
Very bad	11	18.3
Total	60	100.0

Source: Field Survey, 2017

Prevalence of On-Street parking in the Study Area

In carrying out the objectives of this research, a count was carried out to obtain the prevalence of on-street parking over a selected period of time along the road corridor of the study area. The parking survey was carried out between the hours of 6:00 am to 6:00 pm at intervals of two (2) hours on Monday 24th July 2017 to Saturday 29th July 2017. The result of the volumetric parking survey has been collated accordingly and presented thus:

Volumetric parking survey along Kpakungu road Corridor Minna-Bida Road on Monday

Table 3 reveals that a total number of 1146 vehicles parked on the street of Kpakungu during observed hours of the day. The traffic constitutes of 535 cars, 230 tricycles, 22 buses, 37 trucks, 315 motorcycles and 7 bicycles. This shows that cars are the most frequently used vehicles on the road corridor. Monday recorded a considerable large number of cars which are mainly commercial vehicles; it also recorded a large number of trucks which consisted of petrol tankers, and trailers offloading loads to different commercial business. A considerable number of buses was recorded which was used mainly to pick and convey students of different schools. It can be deduced from Table 4.2 that on-street parking is at its peak between 8:01 am - 10:00 am and 2:01p – 4:00 pm. This is in line with the reality of the two peak periods which exist between the morning and evening periods.

Table 3: Volumetric Traffic count for Monday

Time	**Types of vehicles**						**Total**
Period	Cars	Tricycle	Buses	Trucks	Motorcycle	Bicycle	
6am-8am	82	19	2	8	17	0	**128**
8:01-10pm	82	52	4	6	90	4	**238**
10:01-12pm	90	42	6	7	50	1	**196**
12:01-2pm	100	47	2	5	80	0	**234**
2:01-4pm	98	43	5	7	53	2	**208**
4:01-6pm	83	27	3	4	25	0	**142**
Total	**535**	**230**	**22**	**37**	**315**	**7**	**1146**

Source: Field Survey, 2017

Volumetric parking survey along Kpakungu road Corridor Minna-Bida Road on Tuesday

Table 4 shows the volumetric count for Tuesday, which differs slightly with that of Monday. It reveals a total number of 1067 transport vessels were counted during the observed hours of the day. The traffic constitutes 466 cars, 236 tricycles, 50 buses, 61 trucks, 251 motorcycles and 3 bicycles. Motorcycles recorded the second highest number that parked on the street. Tuesday also recorded the peak periods between 8:01 am – 10:00 am and also 2:01 – 4:00 pm.

Table 4 Volumetric Parking Survey for Tuesday

Time	**Types of vehicles**						**Total**
period	cars	Tricycle	Buses	Trucks	Motorcycle	Bicycle	
6am-8am	62	21	8	17	25	0	**133**
8:01-10pm	105	37	9	9	40	1	**201**
10:01-12pm	66	36	7	10	40	2	**161**
12:01-2pm	87	42	7	11	51	0	**198**
2:01-4pm	89	62	12	9	58	0	**230**
4:01-6pm	57	38	7	5	37	0	**144**

Total	**466**	**236**	**50**	**61**	**251**	**3**	**1067**

Source: Field Survey, 2017

Volumetric parking survey along Kpakungu road Corridor Minna-Bida Road on Wednesday

Table 5 differs greatly with the previous days due to it being the middle of the week. A total number of 870 vehicles parked on the street of Kpakungu during observed hours of the day. The traffic constitutes of 458 cars, 140 tricycles, 42 buses, 64 trucks, 165 motorcycles and 1 bicycle. Bicycles recorded the least which reveals that most commuters don't use bicycles. It can be deduced from Table 4.4 that on-street parking is at its peak between 8:01 am - 10:00 am and 2:01p – 4:00 pm. While the off-peak periods were between 6:00 am – 8:00 am and 4:01pm-6: 00 pm with a total number of 124 transport vessels and 82 transport vessels respectively.

Table 5: Volumetric Parking Survey for Wednesday

Time			**Types of vehicles**				**Total**
period	Cars	Tricycle	Buses	Trucks	Motorcycle	Bicycle	
6am-8am	65	14	9	21	15	0	**124**
8:01-10pm	117	30	3	13	38	0	**201**
10:01-12pm	76	22	4	11	18	1	**132**
12:01-2pm	68	22	7	5	24	0	**126**
2:01-4pm	86	37	15	10	57	0	**205**
4:01-6pm	46	15	4	4	13	0	**82**
Total	**458**	**140**	**42**	**64**	**165**	**1**	**870**

Source: Field Survey, 2017

Volumetric parking survey along Kpakungu road Corridor Minna-Bida Road on Thursday

A significant increase in traffic was noticed on Thursday along the same road corridor. Table 6 reveals that 1286 transport vessels parked on the street of the study area. The survey constitutes of 387 cars. 376 tricycles, 36 buses, 29 trucks, 453 motorcycles and 5 bicycles. Cars, motorcycles, and tricycles are the most frequently used transport vessels along the corridor. The morning peak period was between 8:01 am -10:00 am with 233 transport vessels while the evening peak period was between 4:01 pm – 6:00 pm with 281 transport vessels. The traffic was least between the hours of 6:01 – 8:00 am with a total of 82 transport vessels.

Table 6: Volumetric Parking Survey for Thursday

Time	**Types of vehicles**						**Total**
period	cars	Tricycle	Buses	Trucks	Motorcycle	Bicycle	
6am-8am	48	16	1	5	12	0	**82**
8:01-10pm	58	68	12	7	87	1	**233**
10:01-12pm	51	67	3	4	90	0	**215**
12:01-2pm	83	74	3	5	69	2	**236**
2:01-4pm	62	68	10	3	95	1	**239**
4:01-6pm	85	83	7	5	100	1	**281**
Total	**387**	**376**	**36**	**29**	**453**	**5**	**1286**

Source: Field Survey, 2017

Volumetric parking survey along Kpakungu road Corridor Minna-Bida Road on Friday

Friday the end of the working days has a volumetric count that differs with the other days of the week observed. Table7 reveals that 1422 transport vessels were counted during the observed hours of the day. The peak and off-peak periods were also observed. The table revealed that on-street parking was at its peak between 10:01 am – 12:00 noon and 12:01-2: 00 pm. The evening peak was noticed to have a significant increase in on-street parking due to the Muslims gathering to observe their Friday Jummat prayer. It was also noticed that the period of 4:01 - 6:00 pm had a considerable number of on-street due to the fact that most dwellers were traveling for the weekend.

Table 7: Volumetric Parking Survey for Friday

Time	**Types of vehicles**						**Total**
period	cars	Tricycle	Buses	Trucks	Motorcycle	Bicycle	
6am-8am	54	10	0	13	12	1	**90**
8:01-10pm	57	46	12	13	84	0	**212**
10:01-12pm	100	104	9	10	100	2	**325**
12:01-2pm	89	91	7	37	111	0	**335**

2:01-4pm	69	40	15	10	68	5	**207**
4:01-6pm	86	98	4	13	52	0	**253**
Total	**455**	**389**	**47**	**96**	**427**	**8**	**1422**

Source: Field Survey, 2017

Volumetric parking survey along Kpakungu road Corridor Minna-Bida Road on Saturday

The weekend traffic was also observed for the road corridor of the study area. Table 8 revealed that the weekend traffic had a considerable number of vehicles parked on the street. 1178 transport vehicles were counted during the observed hours of the day. It was noticed that the reason for the traffic was due to the fact that Saturday is the market day in the town. Locals coming from different location to the market to sell their goods increased the traffic. Also, a considerable number of trucks were counted, different trailers bring goods of various kinds to the market were counted. The traffic was at its peak during the hours of 8:01 am – 10:00 am and also at 4:01 pm – 6:00 am. It is said noticed the reason for the weekend traffic was due to commercial interest of the people.

Table 8 Volumetric Parking Survey for Saturday

Time period	**Types of vehicles** cars	Tricycle	Buses	Trucks	Motorcycle	Bicycle	**Total**
6am-8am	78	16	3	19	11	0	**127**
8:01-10pm	79	38	7	4	70	0	**198**
10:01-12pm	113	83	16	9	95	0	**316**
12:01-2pm	75	50	0	4	55	0	**184**
2:01-4pm	87	27	3	7	45	0	**169**
4:01-6pm	93	28	0	10	53	0	**184**
Total	**525**	**242**	**29**	**53**	**329**	**0**	**1178**

Source: Field Survey, 2017

Summary of Traffic Distribution for the observed days of the week along corridor

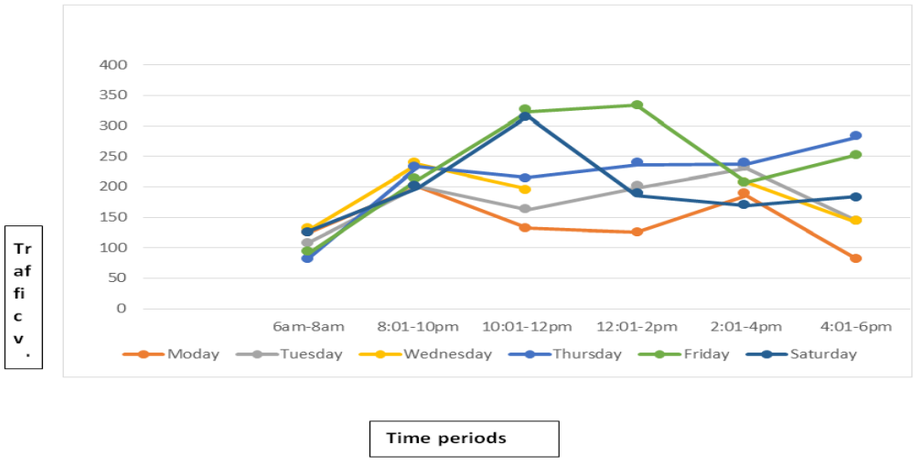

Figure 6: -Traffic distribution for the observed days of the week along corridor A.
Source: - Field Survey, 2017.

Figure 6 summarizes the traffic distribution for the observed days of the week along the corridor of the study area. The most noticeable period of on-street parking along the study area was during the peak hour between 8:01 am – 10:00 am. This is because of individual workers, staff, and students of Technology, Minna who have activities to engage in at Gidan Kwano campus.

It could be deduced from Figure 7 that the two (2) peak periods were constant for most days of the week observed. The hours of the day associated with the peak periods are from 8:01 am – 10:00 am for the morning peak and 2:01pm-4: 00 pm for the evening peak. Figure 8 reveals that the on-street parking is at its highest on Friday. This is due to the increase in on-street parking from the traffic that came to observe their Jummat prayer in the central mosque of the study area.

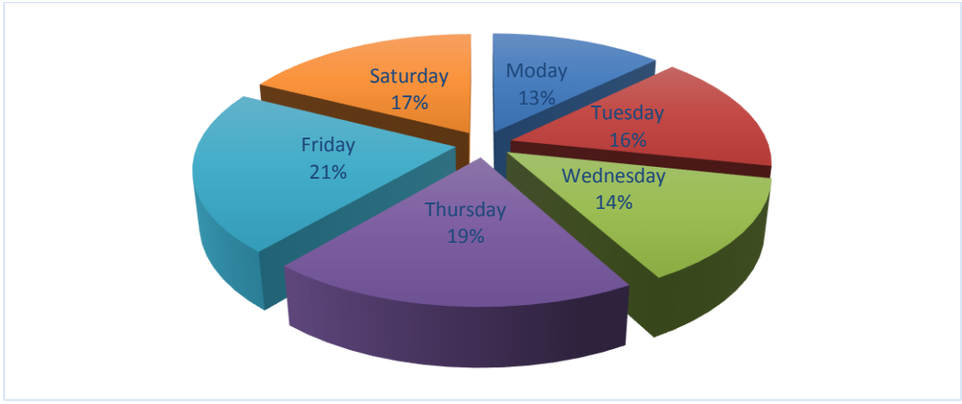

Figure 7: Percentage Composition of Traffic for the days of the week selected.
Source: Field Survey, 2017.

On-Street Parking Volume Composition by Vehicle Type along road studied on Monday.

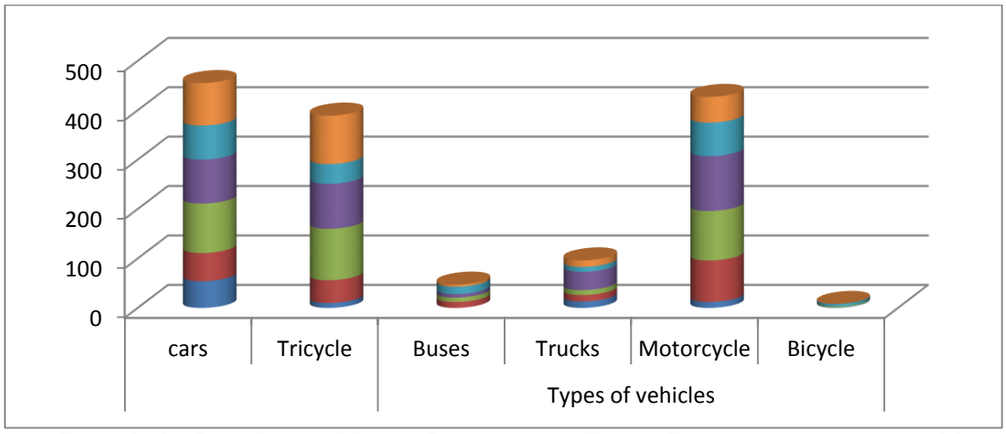

Figure 8**:** On-Street Parking Volume Composition by Vehicle Type along road studied on Monday
Source: Field Survey, 2017

On-Street Parking Volume Composition by Vehicle Type along road studied on Tuesday.

Figure 9 presents the parking composition by vehicle types along the study area for Monday. The figure reveals that cars are the most frequent transport components parked on the street. Motorcycles were also recorded a close second to the cars. It could be deduced that in the event of on-street parking in the area on Monday, the impact was more on cars (private cars and public cars) and also on motorcycles were the most frequent transport vessels that contributed to on-street parking in the study area.

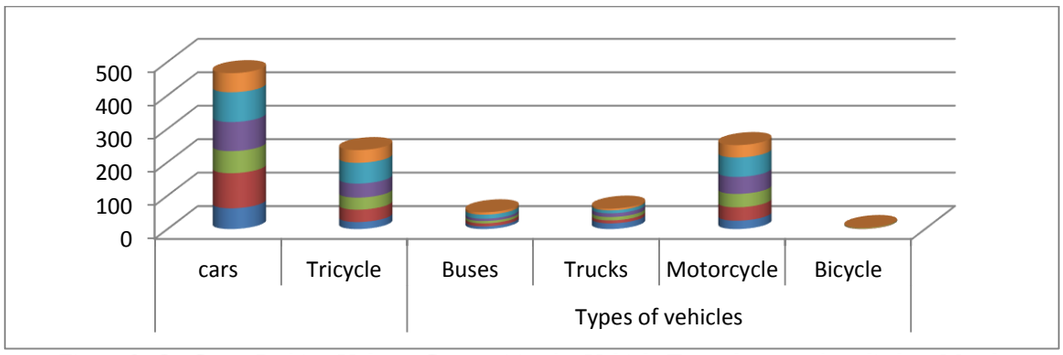

Figure 9**:** On-Street Parking Volume Composition by Vehicle Type along road studied on Monday
Source: Field Survey, 2017

On-Street Parking Volume Composition by Vehicle Type along road studied on Wednesday

Figure 10 shows that the most transport component that was parked mostly were cars, tricycles, and motorcycles. Cars recorded the most frequently parked transport vessels, followed by tricycles and then motorcycles. It could be deduced that the transport vessels that constitute the problem of on-street parking are cars, motorcycles, and tricycles. The problem of on-street parking stems from these transport vessels.

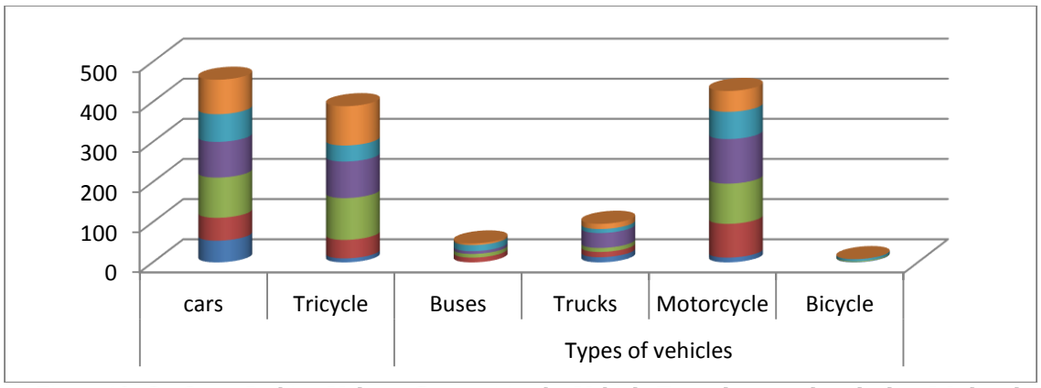

Figure 10**:** On-Street Parking Volume Composition by Vehicle Type along road studied on Wednesday
Source: Field Survey, 2017

On-Street Parking Volume Composition by Vehicle Type along road studied on Thursday

The mid-week parking presents a similar situation with other days of the week though with a considerable decrease in traffic for the day. A considerable number of cars and motorcycles were parked on the street. This is noted that for most of the on-street parking issues, the problem comes from the cars and tricycles used as transport components.

Figure 11 above shows that for Friday, the volume of transport component was mostly motorcycles, which was closely followed by tricycles and cars. A considerable amount of trucks too were parked on the street on Friday compared to other days. The trend of the volume is still same as the rest of the day. The most transport vessels parked on the street are cars, motorcycles, and tricycles.

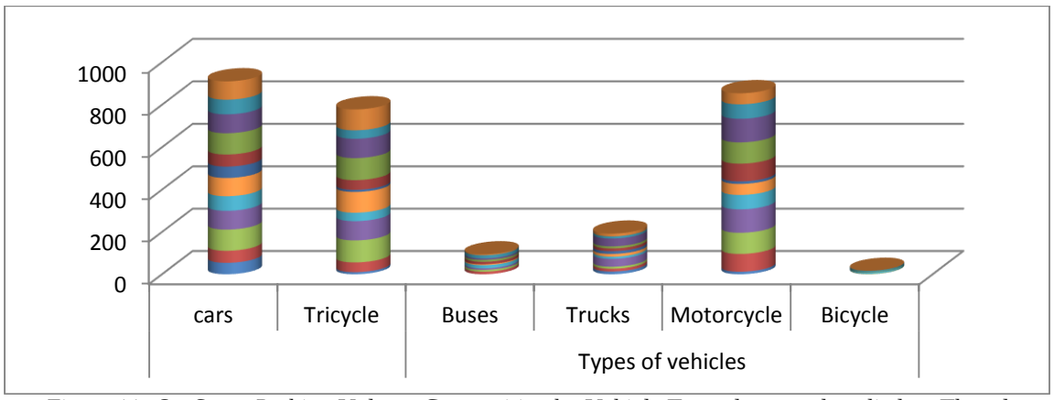

Figure 11**:** On-Street Parking Volume Composition by Vehicle Type along road studied on Thursday
Source: Field Survey, 2017

On-Street Parking Volume Composition by Vehicle Type along road studied on Friday.

The Figure 12 reveals that the traffic components that mostly parked on the street are cars, motorcycles, and tricycles which are the same with other days of the week. Here, a pattern is noticed which shows that bicycles, trucks, and buses contribute less to the problem of on-street parking. To curb this problem, special attention would have to be placed on these transport components.

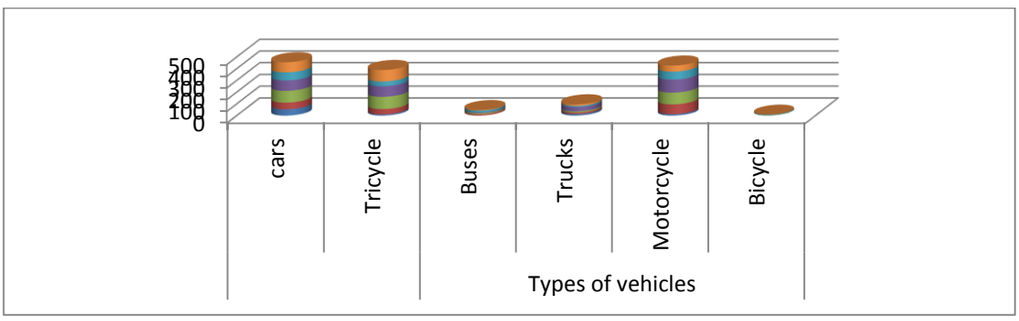

Figure 12**:** On-Street Parking Volume Composition by Vehicle Type along road studied on Friday
Source: Field Survey, 2017

On-Street Parking Volume Composition by Vehicle Type along road studied on Saturday

At the end of the week, the Figure 13 reveals that cars, motorcycles, and tricycles still remain the frequently used traffic component as they record the highest volume all through the corridors studied. Cars maintained the highest volume of transport component parked on the street of the study area.

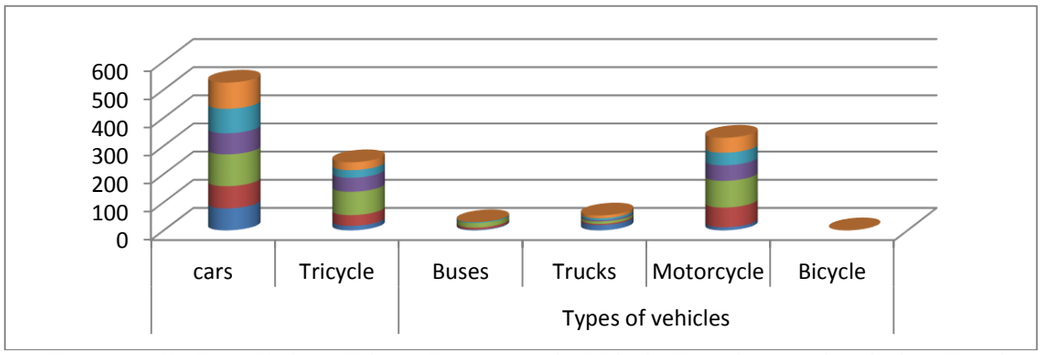

Figure 13**:** On-Street Parking Volume Composition by Vehicle Type along road studied on Saturday
Source: Field Survey, 2017

CONCLUSION

The conclusion of this research work is based on the research findings. An integral part of the transport system which plays a crucial role in the management of traffic and congestion is parking (Allison, 2002). This study has been able to identify the nature, impact, and extent of on-street parking and its effect on traffic in Kpakungu. Some useful suggestions on ways and means to solve these problems were offered. The study accessed the problem of on-street parking in Kpakungu, Minna, Niger state and it has been seen that the problems of on-street parking are apparent in the area. Although the issues of on-street parking are not as bad of those of large cities like Lagos, Ibadan and Port Harcourt, signs of congestion due to on-street parking are already apparent. With increasing population growth, it is expected that the situation will get worse soon unless we provide efficient parking management for our cities.

In conclusion, it is important to note that urgent attention should be given to the problem of on-street parking in order to attain a better urban environment.

RECOMMENDATION

The prevalence of on-street parking is a huge hindrance to the flow of traffic. On-street parking forms one major problem that makes traffic conditions chaotic in Nigerian cities (Asiyanbola and Akinpelu 2012). In the course of the research findings detailed in the previous chapter, the following recommendations have been proposed in order to efficiently and effectively deal with the problems of on-street parking in the study area.

1. The narrowness of the carriageway do not give enough space for on-street parking (side kerb parking) and due to the absence of the provision of on-street parking on the street parking, road users resort to parking on the street. This leads to constricting the already narrow carriageway. It is recommended that the expansion of the carriageway so that on-street parking facilities can be provided.

2. The lack of policies guiding or restricting on-street parking in the study area has immensely affected the flow of traffic. An installation of “No Parking” and ’No Waiting” signs should be placed in strategic spots, so as to solve the problem of road users that insist on parking on the street.

3. The need to stop or ban all illegal activities such as illegal commercial activities carried out on the parking space provided for the land use and also on the street. Banning these activities would prevent parking on the street thereby improving the traffic flow.

4. Tax should be allocated or fines should be issued to on-street parking for the duration of the time a road user would park on the street. If this is clearly followed, it would prevent the problem of on-street parking, thereby improving traffic flow.

5. The commercial road users should be given a suitable space off-street, also a sign should be issued to the passengers indicating that they should go into the allocated car parks to use the transport service. This medium would prevent passengers from standing on the roadside waiting for the commercial cars. This would prevent traffic congestion.

6. The use of mass transit is advantageous in moving more people and reduces the transport vessels ploughing the road. Also, the space occupied by smaller vehicles would be greatly reduced. Mass transit lanes should be incorporated in order to reduce traffic congestion

7. An alternate route should be created for trucks and Lorries. The constant use of their vehicles has caused more harm than good to the road and the other road users. If an alternate route is provided, it would prevent traffic congestion and improve the traffic flow.

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ROAD PASSENGERS' PERCEPTION ON THE QUALITY OF BUS TERMINAL FACILITIES IN NIGERIA

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It is typical to find passengers sitting in commercial vehicles or standing by or loitering in a motor park or bus station, in Nigeria. Most road motor vehicle facilities were built with less consideration to the needs of the passengers. The motor vehicle parks that have some of the facilities are not well maintained, making it difficult for most passengers to utilize them. Delayed departures resulting from delayed arrivals of passengers require commuters to wait a while before departing. The waiting experience, hence becomes inconvenient as passengers are dissatisfied with the facilities provided. This study is aimed at examining the perception of passengers with bus stations in Nigeria. Data used for this research were collected primarily from the field work carried out in the course of this study and secondarily from previous related studies. The research tools employed are the observation checklist and the questionnaires. Motor parks situated in Niger State, Abuja, Lagos State and Akwa Ibom State, are randomly selected to signify stations built by the Nigerian government for economic development. Results show that 76.55% of the study population were dissatisfied with the facilities provided in the station and 54.48% agree to the ideology that user-friendly environments increase the satisfaction of commuters. In essence, the perception of passengers on the road transport system has an effect on the sustainability of the transport system in Nigeria.

Keywords: *Quality environment, Satisfaction, Transport station facilities, Wait time*

INTRODUCTION

The benefits of transport infrastructure could only be optimized if it promotes a sustainable transport system that guarantees safe, reliable, efficient and environmentally–friendly movement of people and goods (Femi, 2012). Customer comfort and satisfaction with transportation services can be placed in the context of passengers' interest (Obasanjo 2015). According to Oni (1996) in Obasanjo (2015), Nigerian cities' commuters are not provided with good bus station facilities. Very few permanent bus stands, offer appropriate physical structures and facilities for people to board or disembark from the buses. Passengers often stand by the road side or on the road to board vehicles. Moreover, there is no shelter from the scorching sun or heavy rain. During long waits at the stations, passengers mostly remain standing or seated in vehicles parked at the stations. At night time, not many stops are well lit and this can be a cause of anxiety (Obasanjo 2015). Wait for service has been defined as the time between the moment the consumer is ready to take the service and the moment he is actually receiving the service (Taylor 1994). The experience of waiting is perceived differently by individuals. Most times it is dependent on some factors that include, but are not limited to uncomfortable waits (Davis and Heineke 1998) and length of queue (Nie 2000). Perceived waiting time is discovered to differ from the actual waiting time (Jones and Hwang 2005). Often times, it is perceived to be longer than the actual waiting time. Waiting is a complex phenomenon to which consumers often react to in an emotional way. Depending on the context, delay may be experienced as an enjoyable pastime or an inexcusable imposition (Dube-Rioux, 1989).

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The waiting experience for passengers of transport stations in Nigeria is often times an unpleasant one. Delayed departures of transit vehicles compel passengers to wait, in some cases for a long period, in unconducive environments. In order to make profits, transport operators convey a number of passengers that exceed the carrying capacity of the vehicle. Making the transit experience uncomfortable. The satisfaction of passengers is affected and as a result, there is a withdrawal, by the users, from the use of public transportation. Some users resolve to commuting in privately owned vehicles, for convenience and efficiency. These in turn create problems like traffic congestion, increased accident rates, environmental pollution, vehicle maintenance cost on private car owners and parking congestion. The perception of passengers on road transport station facilities in Nigeria is needed in order to identify the passengers' needs and improve transiting experience by providing standard, user-friendly public transportation facilities to all states in Nigeria.

Quality Of Public Transportation In Nigeria

Public transport, involves services that provide mobility to the general public. Movement is often in communal vehicles ranging from shared taxis and shuttle vans, to local and intercity buses and passenger rail (Litman 2011). For developing countries, where the rate of urbanization is high, there is the need for a sustainable, effective and efficient public transport system. Adeyinka (2013), in the study of the quality of urban transport services in Ibadan Oyo State, discovered that the bus transport service seemed to be the most patronized because it was the cheapest and safest means of transporting the public. That notwithstanding, passengers expressed dissatisfaction majorly with the vehicle overcrowding experience, the vehicle maintenance and the operators' behavior towards passengers. Akindele (2014) studied the case of Kwara state and discovered that passengers perceived the bus stops to be inadequate mainly because of the inconsistent distance between stops. The building design and structure were the second and third factors to affect the perception of the passengers. The least factor considered was the pedestrian circulation. It was also observed that planned bus stops were less in number compared to the unplanned bus stops. Obasanjo *et al* (2015) observed that long travel time, traffic congestion, vehicle overcrowding, poor vehicle maintenance and lack of safety dented the quality of public transportation in Kaduna. Most of the commuters were workers and students within the age range of 20-49 years. These commuters preferred to walk to the bus boarding points, of which, most walked 1-500 meters before getting a bus to board. Interestingly, it was discovered that passengers only waited within the timeframe of 1-20 minutes before departing from the station. Although, this was due to the fact that passengers walked along the transit route in search of a bus and boarded any available bus that passed by. That, notwithstanding, dissatisfaction was expressed with the transport service. This was linked to the transport fare, safety and convenience.

Ali (2010), in a study carried out in Enugu showed that the quality of transport service was perceived to be high in the central areas of the state. This, it was observed, was due to the population density of these areas, the situation of commercial, administrative and residential structures and good road network in these areas. However, a recommendation was made to decongest the central areas by moving some of the commercial structures, offices and motor parks to the remote areas of the state to improve the quality of transportation in those areas. This implies that transport stations, although situated at proximity to passengers, can also contribute to the congestion of an environment. A study on the Abuja Urban Mass Transit, by Nwankwo et al 2016, showed that out of all the public road transport modes available in the city, the mass transit was the most patronized. The study also revealed that commuters' perception to the transit system was low because of long waits at bus stations, which was averagely between 31-40 minutes. Also, passengers complained about reliability, efficiency, comfortability, affordability, overcrowding, safety, accessibility and convenience of the mass transit system. Hence commuters were dissatisfied with the transport service. Nwankwo et al suggested, among others, that bus terminals be defined and upgraded, overcrowding be discouraged, buses be maintained and drivers be trained. Nwachukwu 2014, noted that the common problem associated with public transport in Nigeria is the long waiting period, traffic bottleneck, road accidents, air contamination and parking difficulties. In his study on the Abuja public bus transport service, he observed that bus comfort, accessibility, station facilities and bus capacity adequacy affected the satisfaction of commuters.

Public Transportation Problems

In urban areas, road transportation is the most effective. The need for residents to get to their destinations in quick time influence the formation of illegal motor parks and stops. Illegal in the sense that areas used as pick-up and drop-off points are usually not designated for that purpose by the urban planning authorities of the area. it is formed out of commuters concentrated points, which are usually the central areas of that vicinity. As much as this seem to be the common practice of developing communities, there are anti-developmental effects this practice has on the communities. These problems include traffic congestion, increased accident rates as a result of the increases volume of traffic and air pollution.

Traffic Congestion

Olagunju (2011), describes traffic congestion as the imbalance in the influx and outflux of vehicles from an area. Data obtained from the Federal Road Safety Corps (FRSC) on the number of National Driver's License (NDL) produced between the third quarter of 2015 and the third quarter of 2016, as illustrated in figure 1.0, shows that the licenses were mostly produced for private commuters. Figure 1.1 confirms further that private vehicle owners are more on the streets than the commercial vehicles. This implies that commuters prefer to travel with privately owned vehicles instead of commercial vehicles. This in turn increases the traffic volume on the Nigerian roads.

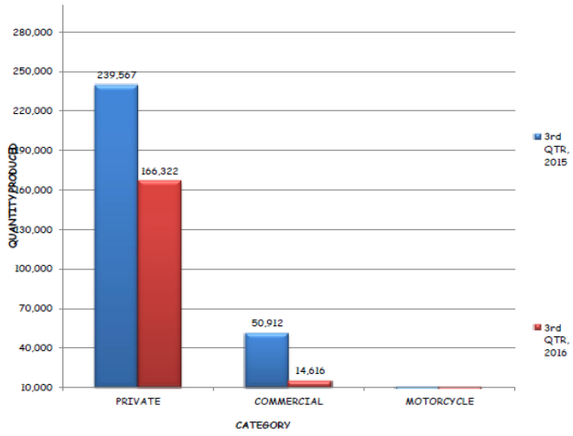


Fig 1.0 3rd Qtr 2015 and 3rd Qtr 2016 Comparative Analysis of NDL Produced
Source: FRSC 2016

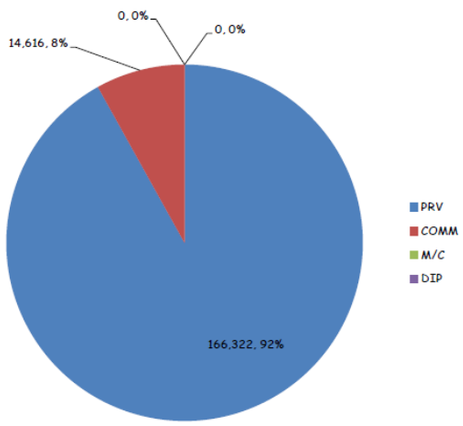


Fig 1.1 Number Plates produced by category
Source: FRSC 2016

Benjamin (2013) recommended, among others , that there should be provision of adequate terminal facilities. By terminal facilities, he was referring to bus stops, lay-byes, motor parks and garages. Roth (1999), cited in Olagunju (2015) suggested that traffic congestion could be solved by refining public transportation, limiting the use of cars and increasing carriageways. Raheem *et al* (2015), in their study on the traffic congestion in Oyo state, recommended, among other recommendations, the provision of roadside parking lots. Ukpata and Etika (2012) suggested that interchanges be constructed and mass transit system

be fortified. These all show that researchers share the same opinion of adequate mass transit provisions as an effective means of curbing traffic congestion.

Accident Rates

According to the Federal Road Safety Corps, 2,397 Road Traffic Crash (RTC) cases were recorded between the 3rd quarter of 2015 and the 3rd quarter of 2016. The Federal Capital Territory (FCT) recorded 347 (14.47%) cases, making it the state with the highest number recorded. Kaduna, Nasarawa, Niger, Ogun and Lagos were states, in descending order, with considerable high numbers of RTC cases as well. Backed up with a detailed information, as presented in Table 1.0, on the number of NDL produced, these states appear to have high number of registered drivers. The author believes that the volume of traffic in these states contributed to the accidents that have occurred in these states.

Table 1.0 RTC Cases and NDL Production on State Basis

State	Fatal	Serious	Minor	Total Cases	No of NDL Production
Abia	5	18	0	23	2,029
Adamawa	8	29	2	39	800
Akwa Ibom	9	3	2	14	1,763
Anambra	17	40	13	70	7,015
Bauchi	25	55	2	82	1,872
Bayelsa	3	5	6	14	1,068
Benue	14	25	45	84	1,460
Borno	3	0	0	3	1,318
Cross River	1	15	3	19	1,498
Delta	8	9	3	20	9,918
Ebonyi	18	18	14	50	1,337
Edo	23	43	7	73	12,181
Ekiti	4	6	1	11	2,619
Enugu	7	41	11	59	4,359
FCT	50	236	61	347	14,431
Gombe	6	16	2	24	3,195
Imo	8	12	6	26	1,937
Jigawa	10	22	1	33	1,266
Kaduna	60	111	12	183	4,494
Kano	21	62	5	88	4,735
Katsina	14	44	0	58	873
Kebbi	6	39	2	47	2,745
Kogi	32	34	8	74	853
Kwara	11	35	2	48	3,522
Lagos	25	55	26	106	42,657
Nasarawa	26	30	81	137	2,589
Niger	18	108	7	133	3,793
Ogun	32	68	11	111	10,692
Ondo	25	40	0	65	3,078
Osun	10	41	8	59	2,912
Oyo	41	40	4	85	9,234
Plateau	6	19	37	62	4,192
Rivers	7	16	11	34	13,127
Sokoto	4	21	3	28	352
Taraba	10	28	1	39	494
Yobe	7	11	0	18	289
Zamfara	9	21	1	31	241
Total	**583**	**1416**	**398**	**2397**	**180,938**

Source: Federal Road Safety Statistical Digest, 3rd Quarter, 2016

The World Health Organization (WHO), showed in its global data repository, that about 5.8 million vehicles were registered in Nigeria, as at the year 2013. This makes Nigeria the 3rd African country with registered vehicles. This is shown in Figure 1.2.

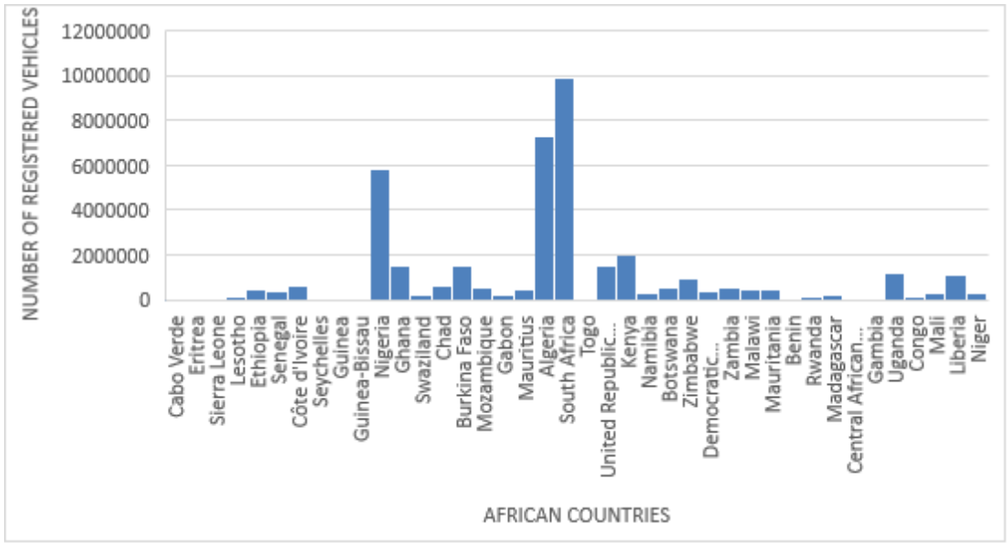


Fig 1.2 African Countries with Registered Vehicles
Source: WHO, 2016

Air Pollution

Air pollution in major cities of Nigeria mainly come from vehicle emissions, industries and domestic sources (Roychowdhury *et al*, 2016). Because the use of eco-friendly vehicles is yet to be implemented in Nigeria, vehicles still use fuels that release toxic gases into the atmosphere. Roychowdhury *et al* (2016) noted that carbon monoxide is high at traffic congested Nigerian cities because of the use of petrol cars. The WHO, in their fact sheet of 2016, recognized the following compounds as evidence of polluted air; Particulate Matter (PM), Ozone (O_3), Nitrogen dioxide (NO_2) and Sulphur dioxide (SO_2). Particulate matter is described by the WHO as "*a mixture of solid and liquid particles of organic and inorganic substances in the air"*. Often measured in micrograms per cubic meters ($\mu g/m^3$), the pollution particles considered as health-risky are *particles with a diameter of 10 microns (PM_{10}) or less*. This implies that particles smaller than 10 microns are more dangerous because they can infiltrate the deep parts of the lungs and cause severe damage like lung cancer and respiratory diseases. Particulate matter, also known as pollution particles consists of sulphate, nitrate, ammonium, sodium chloride, black carbon mineral dust and water. PM, just like other air pollutants is found to be emitted from running vehicles, industrial combustion and houses as well. To measure the quality of air, PM_{10} and $PM_{2.5}$ are used to identify pollution particles that are either less than 10 microns or less than 2.5 microns. A benchmark set by WHO for PM_{10} and $PM_{2.5}$ is as follows;

$PM_{2.5}$	=	10 $\mu g/m^3$	Annual Mean	**PM_{10}**	=	20 $\mu g/m^3$	Annual Mean
	=	25 $\mu g/m^3$	Daily		=	50 $\mu g/m^3$	Daily

This means that for every pollution particle with a diameter of 2.5 microns, its concentration should not exceed 10 $\mu g/m^3$ yearly or 25 $\mu g/m^3$ daily. Also, for every pollution particle with a diameter of 10 microns, its concentration should not exceed 20 $\mu g/m^3$ yearly and 50 $\mu g/m^3$ daily. Information from the WHO, as represented in Figure 1.3, shows that the concentration of $PM_{2.5}$ nationwide is about 38.8 $\mu g/m3$, out of which 37.6 $\mu g/m^3$ are found in urban areas. This measure is above the set benchmark of 10 $\mu g/m^3$ annually, revealing that the air quality of Nigeria is low mainly because of the urban areas.

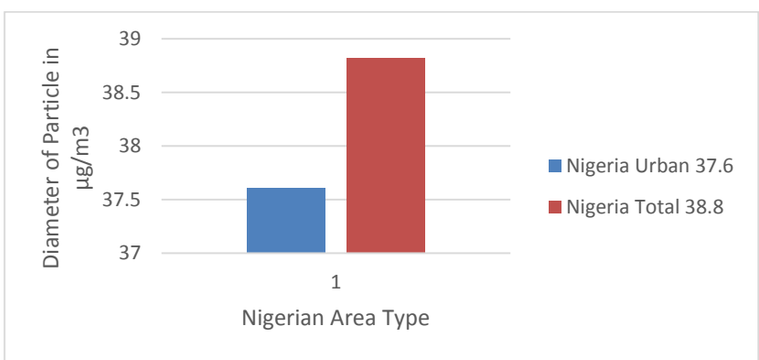


Fig 1.3 Concentrations of Fine Particulate Matter ($PM_{2.5}$) in Nigeria
Source: WHO 2016

Information acquired from the Federal Ministry of Environment, on the levels of particulate matter in traffic areas, as cited in Roychowdhury *et al* 2016, shows that PM_{10} are mostly found in traffic congested and industrialized areas. This is represented in Figure 1.4.

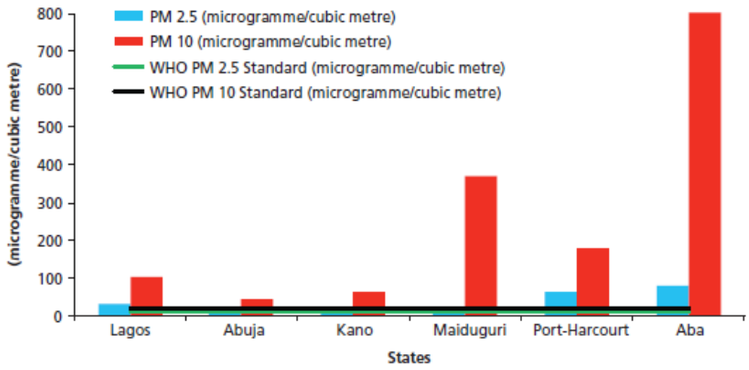


Fig 1.4 Air Quality of Nigerian Industrial and Traffic Congested Area
Source: Federal Ministry of Environment, 2015

Because there are not many large industries in Nigeria, but large number of vehicles, these results imply that most of the pollutant particles are emitted from vehicles. In simpler terms, vehicles contribute greatly to the polluted atmosphere of Nigeria. With this, there is the need to employ standard, efficient, mass transiting system in order to reduce the traffic volume on the streets and improve the air quality, in turn improve the safety and health of residents and commuters in Nigeria.

Commuters' Satisfaction

Friman *et al* (2013) defines satisfaction with transport systems as the degree to which the system fulfils travel needs of commuters. He further states that to assess fulfillment, a cognitive judgment on the cost, travel time, punctuality, information and delays, by the travelers are to be considered. Using the Satisfaction with Travel Scale (STS), Friman *et al* (2013) studied three urban areas in Sweden and found that those who drove, cycled or walked were more satisfied than those who commuted through public modes of transport. Reasons he discovered was because they were comfortable, pleasurable and engaging. Although, those who cycled and walked lived close to their place of work. Inasmuch as these active commuters, as described by St-Louis *et al* (2014) and Turcotte (2011), seemed more satisfied than the public transport commuters, the issue of traffic congestion and long commute time were the negating factors for vehicle owners in urban areas (Turcotte 2011 and Friman *et al* 2013). Congestion may have been as a result of the increased number of vehicle owners, due to their dissatisfaction with public transport modes. Public transport commuters also expressed dissatisfaction because it took longer time to arrive at their work place. This goes to show that delay is the major cause of dissatisfaction for commuters, therefore a satisfied commuter is one who gets to his/her destination in good time.

Transport Service Quality

For the assessment of services rendered in a transport system the following are considered; service scheduling and reliability, service coverage, information, comfort, cleanliness, and safety and security (Eboli and Mazzulla, 2009). Service scheduling shows the number of runs per hour or per day; service time represents the time the service is available; service reliability is measured by the consistency of scheduled runs; service coverage tells the number of stops, the distance between stops and the extent the transit service covers; information indicates what the departure and arrival times are, where the boarding and alighting stop locations are, the costs of ticket, and all information needed for transit; comfort includes seat comfort, acceleration and braking, vehicle noise, and odors when in transit; cleanliness of stations, stops and vehicles; safety and security connotes an accident free and a crime free transit. Also, environmental protection, and customer service approach constitute the service aspects of the transport system. The quality of transport service is affected by these aspects and are determined by the way commuters perceive them. In a study carried out in Cosenza, Italy, ratings on a scale of 1-10 were used to examine attributes that were perceived as important and also attributes perceived as satisfactory in transport services. It was discovered, as represented in Table 1.1, that passengers were mostly satisfied with the appearance of the transport personnel, the ticket purchasing method and the secured travel. However, dissatisfaction was expressed with the lack of waiting shelters and seats at

bus stops, absence of transit schedule and information, but these were highly regarded as important. This goes to show that the physical state of the transport facility is also a contributing factor to the overall satisfaction of the transport service.

Table 1.1 Service Importance and Satisfaction Statistics

			Importance		Satisfaction	
Service Aspect	**Service Attribute**	**No**	**Mean**	**Var**	**Mean**	**Var**
Route Characteristics	Path	1	9.17	1.82	8.15	3.68
	No. of Stops, distance between stops	2	8.61	2.74	8.23	2.99
	Bus stop location	3	9.43	1.05	8.44	3.84
Service Characteristics	Service Frequency	4	9.65	0.63	6.78	4.91
	Daily Service Time	5	9.53	0.81	6.57	
Service Reliability	Reliability of runs that come on schedule	6	9.73	0.75	8.69	3.49
	Punctuality (runs that come on time)	7	9.62	0.99	8.26	3.65
Comfort	Bus Crowding	8	9.36	1.65	8.55	3.57
	Comfort of seats on bus	9	9.29	1.16	7.70	5.08
	Air conditioning on bus	10	9.46	0.88	7.32	7.38
	Levels of noise and vibration on bus	11	9.06	2.07	7.01	6.82
	Availability of shelter and benches at bus stop	12	9.57	0.78	5.53	8.31
Cleanliness	Cleanliness of bus interior, seats and windows	13	9.51	0.87	7.63	4.52
	Cleanliness of bus exterior	14	7.85	4.58	7.44	4.13
Fare	Ticket cost	15	9.12	2.03	8.41	3.81
Information	Availability of schedule/maps on bus	16	9.52	0.80	7.00	7.94
	Availability of schedule/maps at bus stops	17	9.61	0.65	3.75	5.93
	Availability of information by phone or internet	18	8.94	3.00	7.44	5.30
Safety and Security	Vehicle reliability, competence of drivers	19	9.91	0.19	8.45	3.93
	Security against crimes on bus	20	9.80	0.59	9.10	2.69
	Security against crimes at bus stops	21	9.78	0.42	7.58	5.16
Personnel	Personnel Appearance	22	9.35	1.35	9.04	2.04
	Personnel Helpfulness	23	9.75	0.41	8.25	4.78
Customer Service	Ease of purchasing a ticket	24	9.65	0.75	9.34	1.69
	Administration of complaints	25	9.77	0.50	7.45	6.23
Environment	Use of ecological vehicles	26	9.70	0.79	6.26	7.00

Source: (Eboli and Mazulla, 2009)

The Perception of Waiting Time

Wait for service has been defined as the time between the moment the consumer is ready to take the service and the moment he is actually receiving the service (Taylor 1994). Wait for service is seen to be fatal for the satisfaction, loyalty and the image of a service provider (Van et al 2012). Time is significant in service delivery. It is mentioned as one of the most important factor considered by customers for purchasing a service (Jones and Hwang 2005). Maister (1985) identified the following propositions to influence the perception of waiting time;

i. Unoccupied time feel longer than occupied time
ii. Anxiety makes wait feel long
iii. Uncertain waits feel longer than certain waits
iv. Pre-process waits feel longer than in-process waits
v. More valuable the service, the longer people will wait
vi. Solo waiting feel longer than group waiting

Other suggestions were developed from these propositions to state that uncomfortable waits feel longer than comfortable waits (Davis & Heineke, 1998). Katz et (1991), Smidts & Pruyn (1994), Jones & Peppiatt (1996), Pruyn & Midts (1998), Groth & Gilliland (1998) and Luo

et al (2005), conducted studies to test these propositions (Jones and Hwang 2005). Their findings were recorded in table 1.2.

Table 1.2 Examples of results between actual wait time and perceived wait time

Study	Field	Actual Wait Time (mins)	Perceived Wait Time (mins)	% Difference	Actual Difference
Katz et al (1991)	Bank	4.20	5.10	21%	54
Smidts and Pruyn (1994)	Dutch Hospital Clinic	22.60	23.10	2.2%	30
Jones and Peppiatt (1996)	England Retail	2.78	3.80	37%	61
Pruyn and Midts (1998)	Dutch Hospital Clinics	15.00	16.10	7%	66
Groth and Gilliland (1998)	Study1: Fast Food USA	5.84	5.28	-10%	-33.5
	Study 2: Bookshop USA	4.34	5.25	21%	54.7
Luo et al (2005)	USA Pizza Shop	4.67	3.59	-23%	-64.8

Source: (Jones and Hwang, 2005)

From this findings, Jones and Hwang noted that individuals exaggerate their wait time in the queuing situations like banking, retail and medical settings. It was also noted that the degree of perceived wait time is not proportional to the actual wait time but can be absolute, implying that wait time can be exaggerated by roughly one minute. The level of exaggeration may or may not be reduced if the customers are occupied (Jones and Hwang 2005). Maister (1985) suggested that the waiting experience is dependent on the waiting context. Looking at the fast foods and pizza shop studies in table 1.2, the differences between the perceived and actual time are lesser than those of the banking, retail and medical studies. This could be as a result of the engagement of customers in some activity within the service environment, which tends to occupy them allowing them to give a more accurate perception to time. This implies that keeping people busy in such environments helps people pass time without realizing how much time they've spent. Clock time is an objective, external non-social referent for the unfolding of behavior, whereas perceived time grows out of social relations behavior and is influenced by feelings, beliefs, desires and the cultural context in which waiting takes place (Pruyn & Smidts 1997 in Jones & Hwang 2005).

Quality Environment

Rönn (2012) describes quality in architecture as an open concept that allows for deliberations on values and identified design criteria. Quality in Architecture, according to Charles Nelson (2006), is "improving the degree to which design fulfil needs and expectations". Charles defined quality as "the degree to which a set of inherent characteristics fulfils stated, implied or obligatory needs or expectations". In a publication by the Norwegian University of Science and Technology, Wyckmans (2013) suggested that architectural quality, relative to public spaces, should give attractive and user-oriented environments. To achieve quality architectural environments, the environmental context has to be appreciated. The site, the neighboring features, the culture and climate should be harnessed to yield visual suitability, character and richness Rönn M. (2012), Wyckmans (2013). There should be quality in the sense of comfort, safety, accessibility, and physical stimulation like touch, smell, vision and sound. Also, cost-efficiency, flexibility and sustainability contribute to a buildings quality.

Transport Stations

Transport stations are significant elements in the operations of a transportation service. They are points where transit routes start and ends (World Bank Group and Public Private Infrastructure Advisory Facility PPIAF, 2006). Passengers board and alight from transit vehicles at these points also. The size and nature of its facilities may vary from a roadside stop with no facilities for passengers or crews, to a purpose built off-road station offering a wide range of facilities. As large number of vehicles arrive and depart, commuting large number of passengers who board and alight from transit vehicles, it is necessary to provide facilities for the convenience of passengers. The primary functions of a transit station consist of arrival, alighting, waiting, parking, boarding and departure of people and goods. The design and location of a station affect the efficiency of the transport system. It is essential

that stations are located where routes connect or terminate as determined by passengers' demand pattern.

Transport Station Architecture

Transportation terminals are designed to have two main areas; a terminal hall and a loading area. The terminal hall usually contains the passenger waiting and circulation areas, stores, cafes, ticket booths and conveniences. Terminal buildings are strongly connected to the demands and expectations of travelers (Lindstrom, 2013). A study made on public transport travelers showed that the environment for waiting areas is highly valued by the travelers (Lindstrom, 2013). Increased quality of the environment increases the quality of travel which yields to an increase in the number of passengers. The following contributes to the quality of the waiting environment; comfortable seating, conveniences, stores, adequate lighting (Lindstrom, 2013). Waiting areas should consider passengers' safety, passengers' comfort, functional similarity, and ease of maintenance. The State of Minnesota Metropolitan Council states in its station and support facility guidelines, the factors to consider in sizing waiting areas. These factors include average peak period passenger usage, length of average wait time, location-specific conditions such as wind, and optimized sight lines. Waiting areas may be enclosed or may consist of overhead canopy alone, overhead canopy with transparent windscreens, or structures with both roof and transparent walls to permit easy surveillance. Enclosed waiting areas should be reserved for high volume terminals or used where terminal equipment requires protection from the elements. Station design provide access to the transit way and transit information to customers. The path a customer takes from the street to a platform is vital to his or her experience of the system. Distances should be kept as short as possible, in order to reduce the time and effort spent in reaching the stations. Changes in elevation should be minimized, and when unavoidable, escalators and lifts should facilitate movement, especially for people with special needs, the elderly, people with children, luggage, bikes or other bulky items; and wheelchair users. Spaces should be orderly, easy to navigate, with good aesthetics to help customers feel at ease and comfortable.

Sequence of Movement in Transport Terminal

The sequence of movement describes a traveler's possible activities during their stay in the terminal (TransLink Transit Authority, 2012 in Lindstrom, 2013). First, a traveler goes through the entrance of the terminal, then inquires, seeking information concerning his trip from a terminal personnel or depending on the facility available, access information displayed on screens. Then the traveler may purchase a ticket before walking to the boarding platform or waiting area. To avoid conflicts, the terminal should be designed with direct communications between activities to ensure efficient flow of travelers (Lindstrom, 2013). Figure 1.5 is a representation of the sequence of movement.

Fig 1.5 The sequence of movement of a traveler at a terminal building
Source: TransLink Transit Authority, 2012

Wayfinding provides guidance and the means for people to navigate transit systems from their trip origin to their destination. Wayfinding is achievable on two levels, that is the system-wide level and the station-wide level. System wide wayfinding helps travelers find their way to their final transit stop while station-wide wayfinding enables travelers find their way to the boarding platforms or street level.

Safety in Transport Stations

Safety is important in terminals. Travelers need to feel safe when waiting for the transport vehicle. Providing stores and other sales outlets in the terminal implies the presence of workers. Knowledge of this allows the travellers to feel secured (Lindstrom, 2013). Also, adequate lighting gives a sense of security to travelers, especially at dark hours. This could be achieved by both daylighting and artificial lighting. In transport stations, security is provided by giving passengers the awareness that they are safe. This can be achieved by providing well-lit open spaces that are void of hidden areas. Avoiding sharp turns and deep corridors can improve the security state of the station. Also, the installation of surveillance cameras informs passengers that they are being monitored and so they are safe from any physical violation. A designated waiting area indicates a safe waiting environment where passengers can be in close contact with staff of the facility, thereby implying security.

Boarding Platforms

It is imperative that conflicts between passengers and vehicle carriageways be avoided in the design of bus stations. The design should also encourage the arrival and departure of a number of buses at the same time, without obstructions from other buses. The boarding and alighting platforms could either be separated completely from the terminal building or connected to the building (Lindstrom, 2013). According to Boer *et* al (2009), three basic platform designs include the roadside station, with the sidewalk in front of the station serving as the boarding platform as illustrated in Figure 1.6 and the one-island platform isolated with two-row bus stops Figure 1.7. Dock platforms, characterized by angular bus parking right next to the terminal, are suitable for end stations, where the terminal is the final stop. Platforms may also be an existing sidewalk like existing local bus stops.

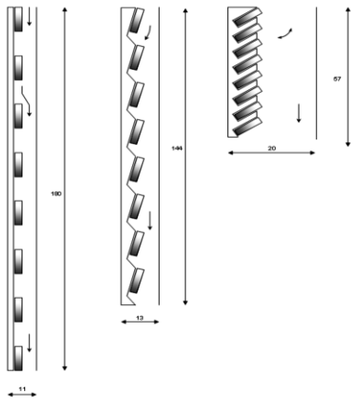


Fig 1.6 Road Side Platforms
Source: Boer et al 2009

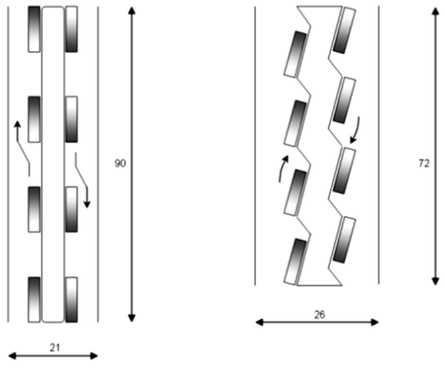


Fig 1.7 One-Island Platforms
Source: Boer et al 2009

Real-Time Information: Public Displays and Announcements

Information for customers who are in transit is most useful when it is in real time (Kwon et al, 2013). Real-time information uses GPS tracking to provide accurate arrival times. There are different ways to deliver this information which include mobile devices, public display signs and audio messages. For transit customers without real-time information, perceived wait time is greater than measured wait time; users using real-time information do not perceive their wait time to be longer than their measured wait time. There are seven main effects of real-time information displays: reduced wait time, positive psychological factors (including reduced uncertainty, increased ease-of-use and a greater feeling of security), increased willingness-to-pay, adjusted travel behavior such as better use of wait time or more efficient travelling, effects on mode choice, increased customer satisfaction and, finally, a better image of transit service (Kwon et al, 2013).

Customer Amenities

Customer amenities may include public art, Wi-Fi and cellular phone reception, kiosks and the likes. Art can transform a very busy transit infrastructure into a place of artistic expression, making it more interesting and diverse. Internet access has become essential to every individual and will improve the customer experience in transport stations if this service is provided. This can be achieved by providing passengers with convenient free access to the internet at computer terminals. A transport station or a transport interchange need supporting facilities for effectiveness. These facilities make the station environment conducive, convenient, comfortable and secured. Transport facilities include ticket booths/ticket machines, seats, convenience stores/commercial outlets, rest rooms, baby change rooms café/eateries, control room/control center, public address system, luggage room, security room and parking.

RESEARCH METHOD

The theory dominantly employed in research into customer satisfaction is the expectancy-disconfirmation theory which states that customers are either satisfied or dissatisfied if their experience and perceptions of the product or service exceed or fall short of their expectations. To achieve the aim of this study, research instruments were designed based on

this theory, to examine the satisfaction of passengers with transport station facilities in Nigeria.

With the study being centered on the satisfaction theory of expectancy-disconfirmation, the type of research design applied was the cross-sectional design because the study was carried out at a given point in time. The approach to the cross-sectional style was the theory testing approach, where the satisfaction theory was tested by deducing a number of variables or propositions in accordance to the study focus and observations made to test the accuracy of the theory. The observations were carried out on a population sample and data was obtained primarily through questionnaires and observation checklists. The secondary source of data was from documentations and records obtained from previous studies.

The study population considered for this study were four government developed transport stations structured for public transportation from four states (one in each state), out of the thirty-six states in Nigeria. The aim was to acquire a general perception of Nigerian commuters. The stations studied were Abdulsalam Garage in Niger State, Utako Motor Park in Abuja, Itam Motor Park in Akwa Ibom and Obalende Bus Terminus in Lagos. Descriptive quantitative research was carried out through the use of questionnaires while the qualitative data was obtained through an observation checklist.

Simple random sampling method was used in collecting data from each station. The predominant vehicle used to convey passengers from Niger and Abuja stations accommodated 7 passengers. Questionnaires were issued out to passengers in 10 vehicles in Abdulsalam Garage, Niger State, giving a sum of 70 questionnaires. In Utako Park, Abuja, questionnaires were also issued to passengers in 10 vehicles, giving a sum of 70 questionnaires as well. Vehicles at the station in Itam Motor Park, Akwa Ibom carried 18 passengers. Questionnaires were issued to passengers in 5 vehicles, giving a total of 90 questionnaires issued. In Lagos also, 5 vehicles that carried 18 passengers were issued questionnaires, resulting to 90 questionnaires distributed. This brings the total to 320 questionnaires issued out to four transport stations in four states in Nigeria.

Data was obtained primarily with the use of questionnaires administered to passengers at these stations on their perception of the facilities provided in the stations. Also, an observation checklist was used in assessing the existing structure and the state of the facility with respect to its use. Respondents were asked to rate their overall satisfaction with the transport station facility using a five-point Likert scale. Ranging from 1 to 5, the Likert scale had the following description;

1 = Very Dissatisfied 2 = Dissatisfied 3 = Not Sure

4 = Satisfied 5 = Very Satisfied

Also, to back up the respondents' satisfaction rating, their perception to the physical environment as a contributing factor to the satisfaction level was studied. This was also obtained with the use of a Likert scale structure of questions, which also ranged from 1 to 5 with the following description;

1 = Strongly Disagree 2 = Disagree 3 = Not Sure

4 = Agree 5 = Strongly Agree

Descriptive analysis, represented by frequency tables, graphs and charts were used to analyze demographic information acquired while regression analysis with the analysis of correlation was used to analyse the relationship between the dependent and independent variables. Demographic information on the study population included the gender of the research respondents, their age and occupation. Also, a general information regarding their patronage, their perception to station location, waiting time, comfort and the transit schedule, was acquired. This set of information was analyzed with the descriptive analysis tool of the Statistical Package for the Social Sciences software, SPSS, version 17.0 and the result represented through tables and charts.

The ANOVA technique was used to test the satisfaction of passengers against some key requirements of a transport facility to check the significance of a number of relationships developed for the purpose of this study. These relationships were formed, guided by the expectancy theory of satisfaction, which states in simpler term, that customers are satisfied when the expected service is delivered and dissatisfied when the expected service is not delivered. Service, in the context of this study is extended to physical structures put in place to enable the service delivery of a transport station. the analysis checks to see if those

structures are perceived by passengers as significant to their satisfaction. These relationships include;

H_O; The satisfaction of passengers is dependent on the provision of standard transport station facilities

RESULTS AND DISCUSSION

The results from these analyses are presented in forms of tables and charts. First, information from the checklists was presented and the result discussed. Next, was the description of respondents' brief demographic information and general information on their perception of satisfaction with the transport stations studied. Last was the descriptive analysis on the opinion of passengers regarding the station environment and service delivery. Hypothesis generated focused on the dependent and independent variables considered to influence satisfaction of passengers. Result of this analysis were presented and discussed. Out of 70 questionnaires issued in Niger, 61 were retrieved. Out of 70 questionnaires issued in Abuja, 47 were retrieved. Out of 90 questionnaires issued in Akwa Ibom, 20 were retrieved and out of 90 questionnaires issued in Lagos just 17 were retrieved, giving a total of 145 (45%) questionnaires retrieved from the four states. On asking for their input on the improvement they so desire to be incorporated in stations, 48% of the passengers from Abuja suggested that standard modern facilities for public transport stations be developed, likewise 60% from Lagos and 20% from Akwa Ibom state stated the same.

Likert Scale Measurement of Satisfaction with Transport Stations

The design considerations for a transport station facility were itemized and used as variables in analysing the perception of the travellers to ascertain their level of satisfaction with these variables. The measurement scale used was the Likert scale, which ranged from 1-5, with 1 being the lowest and 5 the highest. A mean score was derived by dividing the sum of numbers 1-5 by 5, resulting to a mean value of 3.0, which signifies a point of indecision by the respondents. The variables considered included the station location, the transit schedule, the transit route, the waiting area, communication, conveniences and accessibility. A statistical frequency analysis was carried out and illustrated in Table 1.3 and Table 1.4. Station location was indicated as one with the highest mean value (3.25) implying that most passengers were satisfied with the location of the stations. From Table 1.3, the frequency distribution shows that 28.3% (VDS+DS) were very dissatisfied with the station location, while 42.8% (S+VS) were satisfied with the location of the station. Although, a percentage of the travellers were undecided (29%), this goes to show that commuters were not affected by the location of the transport stations.

Table 1.3 Frequency Distribution of Satisfaction with Transport Station

	Station Location		Trans Schedule		Wait Time Dur		Trans Route		Wait Areas		Info Comm		Conveniences		No of RestR		Accessibility	
	N	%	N	%	N	%	N	%	N	%	N	%	N	%	N	%	N	%
VDS	18	12.4	26	17.9	44	30.3	37	25.5	51	35.2	53	36.6	56	38.6	57	39.3	49	33.8
DS	23	15.9	47	32.4	38	26.2	39	26.9	52	35.9	37	25.5	37	25.5	32	22.1	20	13.8
UNSURE	42	29.0	19	13.1	38	26.2	19	13.1	19	13.1	40	27.6	36	24.8	35	24.1	29	20.0
S	29	20.0	44	30.3	18	12.4	40	27.6	22	15.2	11	7.6	10	6.9	15	10.3	25	17.2
VS	33	22.8	9	6.2	7	4.8	10	6.9	1	.7	4	2.8	6	4.1	6	4.1	22	15.2
Total	145	100.0	145	100.0	145	100.0	145	100.0	145	100.0	145	100.0	145	100.0	145	100.0	145	100.0

Very Dissatisfied = VDS, Dissatisfied = DS, Satisfied = S, Very Satisfied = VS

Author's Fieldwork 2016

Table 1.4 Mean Distribution of Satisfaction with Transport Station

	Station Location	Transit Schedule	Wait Time Duration	Transit Route	Waiting Areas	Info Comm	Conv	No. of RestR	Accessibility
Mean	3.25	2.74	2.35	2.63	2.10	2.14	2.12	2.18	2.66
Std. Deviation	1.310	1.240	1.176	1.311	1.072	1.086	1.130	1.182	1.473
Variance	1.716	1.539	1.382	1.720	1.149	1.180	1.276	1.398	2.170

Author's Fieldwork 2016

The item perceived as the least satisfied was the waiting areas, with a mean value of 2.10. The frequency distribution shows that 71.1% (VDS+DS) of the passengers were not satisfied with the waiting areas, while 34.5% were satisfied with the waiting areas in the stations. A number of passengers (13.1%) were undecided on their perception, but the result implies that the waiting areas were not conducive for the travelers.

Hypothesis Test

A hypothesis was generated to check the relationship between the research variables and the satisfaction level of passengers. A simple linear regression model was used in testing these hypotheses. The linear regression equation used include:

$Y = \beta_0 + \beta_1 X_1 + \beta_2 X_2 + \beta_3 X_3 + \ldots + \beta_k X_k$

Where β_0 = the dependent variable constant

B_k = the predictor coefficient

X = the predictor

The generated hypothesis state that;

H$_O$; The satisfaction of passengers is dependent on the provision of standard transport station facilities

To test the hypothesis, first, a Pearson's bivariate correlation was carried out to check the significance of the variables considered. These variables as identified in the review, includes, in summary, the transit routes, waiting areas, information communication and conveniences. Table 1.5 shows the correlation of these variables with the overall satisfaction of respondents. It indicates that the transit routes and conveniences are variables the respondents perceived to be significant to their overall satisfaction with the transport service. These variables had a significance level of 0 and 0.002 respectively as against 0.001, implying that the overall satisfaction of the passengers was mostly influenced by these two variables. The satisfaction level of the transit route and the waiting areas were correlated at a significant level of 0.005.

Table 1.5 Correlation of Variables

		Overall Satisfaction	Transit Route	Waiting Areas	Information Communication	Conveniences
Overall Satisfaction	Pearson Correlation	1	-.349**	-.113	-.142	-.255**
	Sig. (2-tailed)		**.000**	.176	.089	**.002**
	N	145	145	145	145	145
Transit Route	Pearson Correlation	-.349**	1	.230**	.072	.125
	Sig. (2-tailed)	**.000**		**.005**	.393	.135
	N	145	145	145	145	145
Waiting Areas	Pearson Correlation	-.113	.230**	1	.476**	.333**
	Sig. (2-tailed)	.176	**.005**		**.000**	**.000**
	N	145	145	145	145	145
Information Communication	Pearson Correlation	-.142	.072	.476**	1	.489**
	Sig. (2-tailed)	.089	.393	**.000**		**.000**
	N	145	145	145	145	145
Conveniences	Pearson Correlation	-.255**	.125	.333**	.489**	1
	Sig. (2-tailed)	**.002**	.135	**.000**	**.000**	
	N	145	145	145	145	145

**. Correlation is significant at the 0.01 level (2-tailed).

Author's Fieldwork 2016

For the transit route analysis, the following predictors were used to analyze its significance; transit stops, number of stops, state of route and route network. Using a 0.05 alpha level of significance, there was a significant difference between the transit route and the predictors as determined by one-way ANOVA [F (4,140) = 7.742, p = .000. This implies that passengers actually consider these factors important when examining their satisfaction with the transit routes.

Using the linear regression equation;

Transit Route = 1.49 + 0.37(state of route) + 0.09(route network) – 0.11(transit stops) + 0.11(number of stops)

= 1.95 > 0

This implies that passengers' satisfaction with the transit route tends to increase as these predictors increases. The regression coefficient (Table 1.6) was used to identify which of the predictors have greater effect on the passenger perception to transit routes. Here, the state of the route appears to have greater effect on the passengers' perception on transit route, with a coefficient of 0.366 (0.37%). This shows that commuters are not satisfied with the transit route primarily because of the condition of the routes on which they travel.

Table 1.6 Transit Route Coefficient of Regression

Coefficients[a]								
Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.	95.0% Confidence Interval for B	
		B	Std. Error	Beta			Lower Bound	Upper Bound
1	(Constant)	1.493	.307		4.870	.000	.887	2.100
	State of Route	.421	.100	.366	4.211	.000	.223	.619
	Route Network	.093	.104	.086	.893	.374	-.113	.299
	Transit Stops	-.117	.122	-.107	-.961	.338	-.358	.124
	Number of Stops	.106	.102	.112	1.035	.302	-.096	.308

a. Dependent Variable: Transit Route

Author's Fieldwork 2016

The waiting area significance was also tested and the following predictors were analysed; clean environment, room for circulation, station lighting, customer enquiry, sitting arrangement, seats in waiting area, proper ventilation and ticketing. Also, at a 0.05 alpha level, there was a significant difference between the waiting area and the predictors as determined by one-way ANOVA [F (8,136) = 11.521, p = .000]. This implies that passengers perceive that there is a relationship between the factors considered and the overall assessment of the waiting areas.

Using the linear regression equation;

Waiting Area = 0.49 + 0.18(cust. Enq.) + 0.36(ticket counter) – 0.15(seats) + 0.16(sit arrangement) + 0.10(room circulation) + 0.18(station lighting) – 0.07(proper ventilation) – 0.01(clean environment)

= 1.24 > 0

The result shows that the satisfaction of passengers with the waiting areas of a transport station, increases as these predictors increases. A regression coefficient analysis, as illustrated in table 1.7, identified ticket counter as the factor greatly affecting the perception of passengers on the waiting area, with a value of 0.364 (0.36%). This implies that the ticketing environment is often times not conducive for the travellers and should be considered as the factor mostly perceived to be important to the travellers.

Table 1.7 Waiting Area Coefficient of Regression

Coefficients[a]						
Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	.488	.201		2.425	.017
	Customer Enquiry	.170	.088	.181	1.931	.056
	Ticket Counter	.346	.098	.364	3.545	.001
	Seats in Waiting Area	-.138	.089	-.145	-1.555	.122
	Sitting Arrangement	.150	.093	.156	1.621	.107
	Room Circulation	.081	.078	.095	1.037	.301
	Station Lighting	.162	.079	.179	2.051	.042
	Proper Ventilation	-.061	.083	-.074	-.735	.464
	Clean Environment	-.013	.082	-.014	-.159	.874

a. Dependent Variable: Waiting Areas

Author's Fieldwork, 2016

Convenience was also considered as an important variable in the analysis of passengers' perception with a transport system. The factors considered for this analysis included the convenience stores, convenience stores' supplies, number of rest rooms and condition of restrooms. Again, analyzing with an alpha level of 0.05, there was a significant difference between the convenience variable and its predictors, as determined by one-way ANOVA [F

(4,140) = 29.650, p = .000]. This shows that the independent factors considered are significant when analyzing the convenience of a transport station.

Using the linear regression equation;

Convenience = 0.43 + 0.56(convenience stores) - 0.21(conv stores supplies) + 0.22(number of restrooms) + 0.20(condition of restrooms)

= 1.20 > 0

This result tells that satisfaction with the conveniences provided in a transit station, increases as the independent factors increases. The coefficient of regression, as presented in Table 1.8, shows that convenience stores, with a coefficient value of 0.561 (0.56%), has the most impact on passengers than other factors. This implies that convenient stores are important to travelers and in the case of this study, they were not perceived as adequate for the travelers.

Table 1.8 Convenience Coefficient of Regression

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	.429	.182		2.361	.020
	Conv. Stores	.553	.100	.561	5.548	.000
	Conv. Stores' Supplies	-.217	.104	-.212	-2.093	.038
	No of Rest Rooms	.214	.084	.224	2.547	.012
	Cond. of Rest Rooms	.202	.087	.203	2.334	.021

Author's Fieldwork, 2016

Perception on Station Environment and Service Delivery

Seeking the passengers' opinion on the ideology that the quality of the station environment influences their satisfaction with the transport service, the passengers were requested to respond to the following statements;

i. Quality environment of stations contribute to the comfort and satisfaction of passengers
ii. Prolonged idle waiting is often experienced by passengers
iii. Prolonged idle waiting makes the transiting experience exhausting for passengers
iv. The physical condition of the transit routes is a contributing factor to delayed arrivals
v. Occupied time has a positive effect on the psychology of waiting
vi. Occupied waiting time reduces the anxiety that comes with prolonged waiting
vii. Provision of relaxation spaces in transport stations will improve the waiting experience of passengers
viii. Integration of green elements within transport facilities will enhance the atmospheric and physical condition of the station
ix. The sitting arrangement of waiting areas can enhance social interaction between passengers
x. Amenities should include services that satisfy the class of passengers patronizing the station
xi. The restrooms provided are adequate and accessible to passengers
xii. Proper lighting of the station environment enhances the security of passengers at day and night
xiii. Accurate Information on the transit schedule and routes improve passenger satisfaction
xiv. Actual/Real-time information on schedules are often desired by commuters

Using a five level Likert scale measurement, the perception of passengers was examined by the following levels;

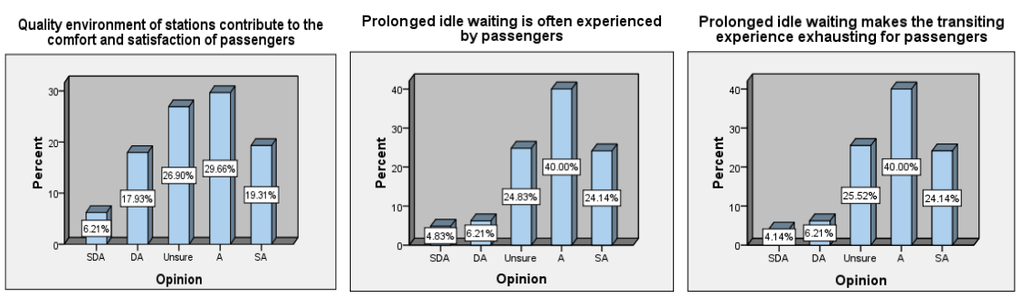
1 = Strongly Disagree = SDA 2 = Disagree = DA

3 = Unsure 4 = Agree = A

5 = Strongly Agree = SA

A descriptive analysis was carried out on the responses of the passengers to these statements. The results, as illustrated in figure 1.8, show that generally, passengers desire to have quality, station environment for comfort and satisfaction. Figure 1.8a shows that 48.97% (A+SA) passengers agreed to the statement that 'quality environment contributes to the comfort and satisfaction of the passengers', 26.90% were undecided about their perception while 24.14% (DA+SDA) disagreed with the idea. On the experience of prolonged idle waiting, 64.14% of the passengers confirmed that they often experience long idle waits (waits with nothing to do), 24.83% were not sure they did while 11.04% disagreed to the statement. This could be because of the lack of amenities to engage passengers while they wait. The statement about prolonged waiting making the transit experience exhausting for passengers had 64.14% agreeing to it, 25.52% not sure about it and 10.35% disagreeing to it. This confirmed the idea the researcher had on the fact that idle waiting can be exhausting for passengers on transit. To find out the passengers' perception on occupied wait time, responses were acquired on the statement 'occupied time has a positive effect on waiting psychology'. Results show that 57.24% agreed to the statement, 31% were uncertain while 11.7% did not agree to the statement. To further seek the passengers' perception on occupied time, the next statement sought their opinion on occupied wait time reducing the anxiety that comes with prolonged waiting. In response, 55.18% of the respondents were in agreement with the statement, 34.48% were not sure about the statement and 10.35% were in disagreement with the statement. These implies that passengers would be more comfortable waiting in an environment that enables them engage in some activity as they wait. The statement 'relaxation spaces improves the wait experience of commuters' had responses that resulted to 68.27% of the passengers agreeing with the idea, 21.38% unsure and 10.35% disagreeing with the idea. This means passengers buy the idea of relaxing while waiting. This implies that wait areas should be conducive enough to give a relaxed feel to passengers as they wait.

Bus stations or motor parks in Nigeria often have more of open, tarred/untarred spaces with little of green (vegetation) incorporated in them. This in a subtle way affects the passengers who go to these stations and end up waiting for long period before embarking on a vehicle. Green gives a serene effect to the environment and also improves the quality of the atmosphere around it. On individuals, green relieves one of stress and anxiety. From the distribution illustrated in figure 1.8h, 73.79% of the passengers examined agreed to the idea of integrating green elements in transport stations. While 17.24% were not sure about it being necessary, 8.97% disagreed to the integration of green elements in transport stations. On transit information and communication, figures 1.8m and 1.8n show that accurate, real-time information on transit schedule improves the satisfaction of passengers with the transport service and is often desired by commuters. With 65.52% of the passengers examined stating their interest in real-time information, it implies that travelers desire that this feature to be incorporated in the road transport system s in Nigeria.



(a) (b) (c)

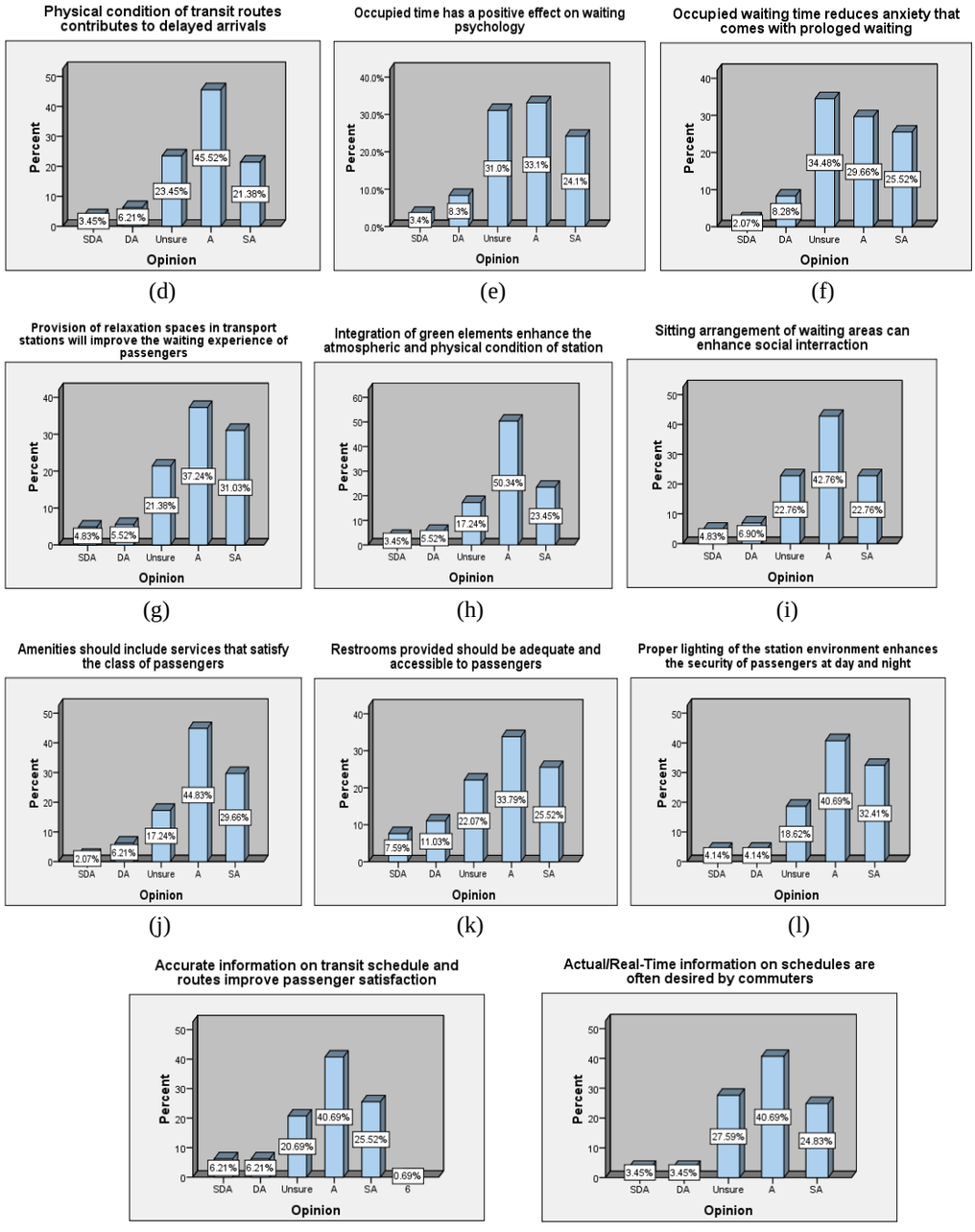


Fig 1.8 Distribution of Passengers' Perception on Quality Station Environment to Satisfactory Transport Service

Passengers' Suggestions for a Better Transport System

Provisions were made for the research participants (passengers) to pen down what they desire to see implemented in the road transport system. The suggestions given and presented in Table 1.9, show that out of 57 suggestions, 23 were on the station facilities, 19 on the management and 15 on the infrastructure as a whole. This implies that the station facilities have a higher impact on passengers than any other stakeholder in the transport system in Nigeria. Although suggestions given on station facilities centered mostly on the wait areas and the conveniences, there were others that suggested the adoption of tea cafés and electronic ticketing. This tells that providing a wait shelter is not just enough but providing one with stress-free and convenient use for the passengers. Suggestions on the management aspect centered on the orientation and sensitization of staff and drivers of the transport stations towards good customer relations, driving and work ethic. This tells that passengers are not satisfied with the way they are treated in transport stations. Suggestions were also made on the provision and maintenance of good roads and vehicles.

Table 1.9 Passengers' Suggestion for Better Transport System

SUGGESTIONS		
On Station Facilities	**On Infrastructure**	**On Management**
1. Environment not convenient for passengers. Provide resting area for people 2. **Conducive waiting areas** 3. **Neat environment** 4. **Provide welfare packages and a tea café** 5. **Modern stations should be constructed in parks** 6. **Good convenience (rest rooms)** 7. **Perfect security** 8. **Passengers' utility hall should be okay** 9. **Proper location** 10. **Enough space for passenger relaxation** 11. **Enough stores for provision in station** 12. **Station to be properly equipped with facilities** 13. **Electronic ticketing** 14. **Restrooms should be kept clean and accessible to passengers** 15. **There should be enough facility to enable passengers' convenience** 16. **Put facilities that will enhance the comfort of the passengers while waiting** 17. **Provide customers with a waiting room and good convenience** 18. **Shelters and chairs should be provided to ease the stress passengers pass through anytime they visit the parks** 19. **A shade to provide some comfort to waiting passengers** 20. **Proper relaxation facilities suitable for passengers on transit** 21. **Entertainment in the waiting areas** 22. **Safe waiting shelters** 23. **Clean green environment will go a long way in making the passengers feel relaxed and comfortable while waiting**	24. Improve the roads 25. Provide good vehicles 26. Good road network 27. Improve vehicle condition 28. Implement policy regarding speed limit in the vehicle 29. Improve the standard of the roads 30. Roads should be rehabilitated 31. Government to assist the masses with standard vehicles that will enable them set discounts from the parks 32. Better roads and less traffic jam 33. Constant maintenance of the roads to avoid bumpy rides 34. More transport vehicles should be provided for easy and faster transit of passengers to avoid prolonged waiting and delayed arrivals 35. Road worthy cars will ease the anxiety of passengers 36. Improvement of transport routes 37. Total reform in transport sector 38. The routes that link all the states should be rehabilitated to enhance good transport service	39. Maintenance of facilities 40. Less delays before departures 41. Sensitization for station staff on work ethics and customer relations 42. Organize seminars for drivers on rules of driving 43. Proper evaluation on their drivers 44. Enhance policies on training the commercial motorists on monthly basis 45. Train drivers well 46. Fix appropriate time of departure to stop delaying passengers 47. Effective and efficient management of transportation facilities 48. Overloading should be avoided 49. Drivers should not be harsh on passengers 50. Drivers should not speed 51. Fix a time schedule and stick to it 52. Staff should be trained 53. Waiting time and internet facilities 54. Constant maintenance of the vehicles 55. Communication between the transport system officials and passengers should really be effective 56. Computerized check of transportation cars 57. Overloading of passengers should be stopped

Researcher's Field work 2016

CONCLUSION

The physical state of bus stations in Nigeria depict a lack in convenient facilities for passengers to utilize. The common ideology is that passengers do not expect to spend time at the station as the primary concern is to board a vehicle and get to their desired destinations, so not much effort is put to achieving a quality environment for bus stations. But that notwithstanding, the delayed departure of vehicles compels commuters to wait, and in most cases for a long period. With these structures not put in place, commuters are mostly dissatisfied with the transport service mainly because terminal facilities are often not user friendly. The results of this research show that the station facility also has an impact on commuters, thereby affecting their satisfaction with the transport system as a whole. This research reveals that apart from the state of the routes, plied by commercial vehicles, affecting the satisfaction of commuters, the state of the waiting facility also has an effect on

the commuters. Commuters desire convenient facilities that will allow for comfortable waits and proper relation between transport operators and travelers, by means of communication of transport information. An environment conducive enough for relaxation while waiting for the transit vehicle. Passengers also desire a structured ticketing system, of which a suggestion was made for an electronic ticketing system. Commuters believe that a well-structured transit schedule will reduce the delayed travels they frequently experience when traveling.

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SPATIAL ANALYSIS AND MODELLING OF CAMPUS SHUTTLE STOPS IN FEDERAL UNIVERSITY OF TECHNOLOGY, AKURE, NIGERIA

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This study addresses the challenges of commuting within the Federal University of Technology, Akure, Nigeria (FUTA) using the distributional pattern of campus shuttle stops within the university. This goal was achieved by studying the existing facilities and modelling a proposed distributional pattern for the shuttle stop locations. The data used for the study include high resolution satellite imageries, coordinates of existing shuttle stops, attribute data of roads, walkways, car parks and trip-generating facilities and data from questionnaires. ArcGIS 10.3.1 software was used based on collected data to prepare a base map showing the existing roads, shuttle-stop, walkways, car parks, and trip-generating facilities. SPSS software was used to collate and analyse information on the existing shuttle stop locations and users' levels of demand extracted from the administered questionnaires. Modelling of the proposed shuttle stop locations was carried out based on standard specifications and considerations adapted from American Association of State Highway and Transportation Official (AASHTO) guidelines and Planning standard in Nigeria. Based on the results obtained, thirteen (13) shuttle stop locations were proposed for FUTA. These consist of eight (8) existing and five (5) new locations. Furthermore, proximity and spatial distribution pattern analyses were carried out to determine the reliability of the proposed locations. The results obtained indicated that the proposed locations exhibit significant improvement over the existing locations. Therefore, it is recommended that five additional shuttle stop locations should be established in FUTA to ease intra-campus commuting.

Keywords: Campus-Shuttle, FUTA, Modelling, Shuttle stop and Spatial Distribution

Introduction

Bus stop is an important aspect of urban transportation system which is essentially the first point of contact between the passenger and the bus service. The spacing, location, design and operation of bus stops significantly influence transit system performance and customer satisfaction (TCRP, 1996). Distribution of Bus S*top locations* has a major impact on transit performance. This is because it affects both access time and line-haul time which is an indication in a trade-off between closely spaced, frequent stops, short walking distance but more time on the vehicle and widely spaced, reduced number of stops, long walking distance but less time on the vehicle (FTA, 2017). As the development of a city improves, it is expected that improvement is needed in the distribution of facilities such as road network, traffic route as well as the transportation facilities with the city. FUTA in recent times has been undergoing tremendous infrastructural developmental changes and expansion which include construction of new departmental buildings, lecture halls, students' hostels and campus road networks, with a corresponding increase in population of members of the institution and consequently trip generating activities. However, these new developments have not been fully captured by the campus shuttle busses. This might not be unconnected with the inadequate information on the spatial distribution of shuttle stops locations within the campus which could lead to long trekking distances and untold hardship on the members of the University community. Therefore, it is the objective of this study to analyse the existing spatial distribution of shuttle stop and proffering an optimised model locations for shuttle stops that will bring about improved intra-campus shuttle accessibility within the University campus.

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In order to analyse and develop an optimised shuttle stop locational model, GIS and statistical techniques were employed considering spacing standards specifications and level of user demand for trip-generating facilities.

Study Area

The study area is the main campus (Obanla and Obakeker) of Federal University of Technology, Akure – FUTA. The study area is located between latitude 07˚ 15' 00" N to 07˚18' 22" N and longitude 05˚07'12" E to 05˚09'10"E, covering about 577 Hectares of land, having approximately 60% of the land area developed. Based on 2017 record FUTA has a student population of approximately 20,000 and a staff population of about 2,300, other members of the university community include FUTA primary and secondary school pupils, traders, bankers, visitors, tourists etc. whose population is usually variable. Some common trip-generating activities are carried out in FUTA campus include administrative, Lectures, practicals, examinations, reading, banking, commercial, religious, sports, recreation, medical, farming etc. Some common land uses identified based on FUTA land use plan include: academic land use (Departmental /School/Faculty building, laboratory, engineering workshop, lecture halls, library) administrative land use (senate building, offices, administrative centers), agricultural land use (research farmland, livestock, fish pond, forest reserve, botanical and zoological garden), residential land use (staff residential, student hostel), commercial land use (banks, business centers, University guest house) Public land use (sporting complex, parks and recreation, Religious/ Worship centers, health center etc).

Factors to Consider in Locating a Bus Stop

In the formulation of locational and spacing standards, consideration are given to safety from danger, nearness or remoteness of one use from another in time and distance; compatibility and the social implications of the users to the residents of the community, land values and site development cost etc (Obateru, 2005). Considerations while locating the bus stops, specified by the Tauranga City Council (2010), include catchment area, distance between stops, topography, demand generators, safety and intersections. Proximity to demand generators can be a significant determining factor whether a trip is made by car or at all in the case of some mobility impaired people who do not have access to independent transport. Hence, bus stops should be located to maximize access to major demand generators. Conversely, bus stops may not be required along sections of road where there is little or no current demand such as rural sections or arterial roads with no pedestrian facilities. In these situations, criteria for coverage and distance between stops will not be relevant. Therefore, the recommended distances seek to provide a balance between access and efficiency depending on the specific requirements of each area or service. Distances should be standardized as much as possible while bearing in mind the other criteria. The following are recommended distances between bus stops as specified by American Association of State Highway Transportation Officials (2014).

- High frequency corridors (<10 mins between buses at peaks): 400m-500m
- Medium frequency corridors (10-30 mins between buses at peaks): 300m-400m
- Low frequency corridors (>30 mins between buses at peaks): 200m-300m.

In practice, an average spacing between 300m and 450m is common in European cities like Paris, London, Rotterdam and Zurich. In Sydney, the average spacing is around 300 m in the Central Business District (CBD) and 350m-400m in the suburbs. The average spacing in the United States is shorter, commonly between 200m and 270m, with even shorter spacing allowed in CBDs. Extremely short spacing such as placing stops at every corner does not seem to be supported by any formal analysis (Alejandro, 2013). A typical bus stop spacing, having values which represent a composite of prevailing practices as specified by (Metro, 2009), is shown in Table 1.

Table 1.0: Bus stop spacing range

Environment	Spacing Range	Typical Spacing
Central core Areas of CBDs	90 to 300 meters	230 meters
Urban Areas	150 to 365 meters	300 meters
Suburban Areas	185 to 760 meters	300 meters
Rural Areas	200 to 800 meters	380 meters

Source: Metro (2009)

Sequence of Decision for bus stop location

Figure 1 explains the sequence to be followed in locating bus stops as defined by Transportation Design Criteria Manual (MAO, 2007).

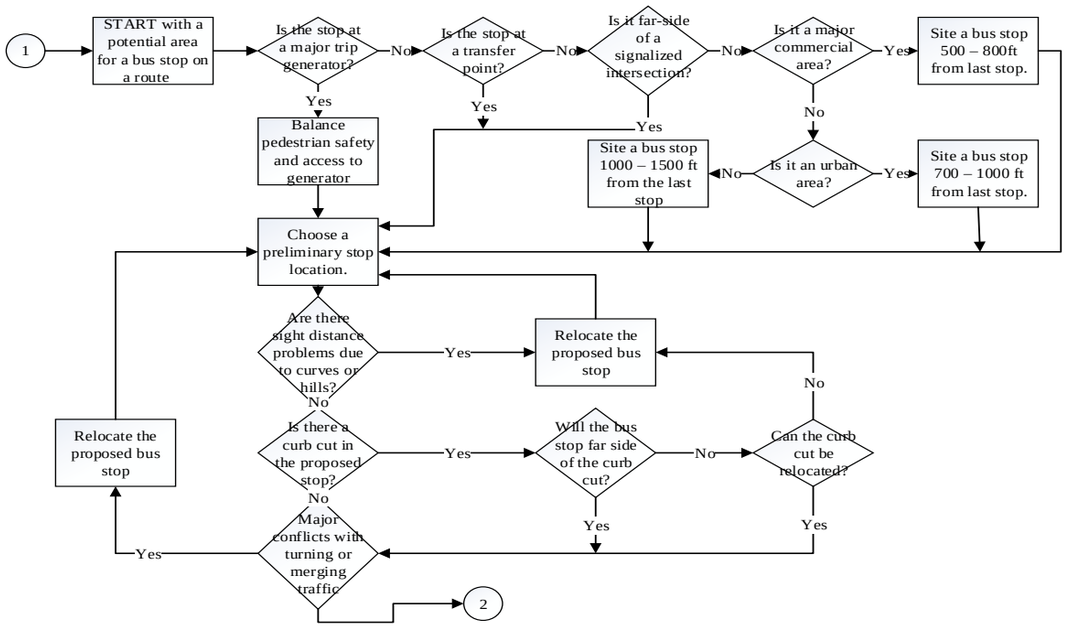

Figure 2.0: Bus stop location Flow chart

Source: MOA (2007)

Overview of Bus Stops Modelling

Mohammed (2008) carried out a study on school bus routing and scheduling for a safe, reliable and efficient transit of school students. He created a Geographic Information System (GIS) based school transport management system which helped in bus-stop allocation, design fastest and safest routes. And the result was used to develop a school bus routing and scheduling prototype model for Sujatha High School. Wanyang (2009) proposed two integer programming models to help identify a priority list of bus stops for accessibility improvements. The first is a binary integer programming model designed to identify bus stops that need improvements to meet the minimum American disability Act requirements. This involved a multi-objective nonlinear mixed integer programming model that attempts to achieve an optimal compromise among the two accessibility design standards. GIS techniques were used to prepare the model input and examine the model output. An Analytic Hierarchy Process (AHP) was applied to combine all of the factors affecting the benefits to patrons with disabilities. Syahriah, et al. (2013) studied bus stop locations and passengers boarding and alighting positions through the application of Global Positioning System (GPS) and GIS methods using the case study of public bus operation in in Malaysia. GIS method was used to capture the locational points during on-board surveys while the GIS method produced the points mapping. Based on these, the possible bus stop locations were recorded and validated based on the passengers' access and egress points and volume patterns.

Data Sources and Collection Methods

In order to model the optimum distribution of shuttle stop location within the study area, there was a need for collecting both spatial and non-spatial data necessary for the modelling. This phase included acquisition of Quick Bird satellite image product which is a high resolution satellite imagery. This satellite product was acquired based on UTM coordinate reference system with WGS84 Origin. It was acquired from the Quick Bird satellite sensor, using the state of the Art BGIS 2000 sensor. The sensor has a swath width of 16.8/18Km and a metric horizontal accuracy of 23m horizontal, a satellite revisit frequency of about 2.4days at 1m ground sampling distance and a resolution of between 0.65m-2.62m (Satellite Imaging Corporation, 2017). Field surveys necessary for coordinating the ground control points required for image registration were acquired using a Stonex Total Station Instrument. A Garmin Hand Held GPS was employed in coordinating the location of the existing shuttle stops location. Attribute data were collected for the roads, walkways, car parks and facilities capable of generating/attracting traffic within the study area. These include administrative building, lecture halls, Staff residents etc. and they were obtained by visiting and assessing the facilities on ground. In order to determine the demand level for the facilities, which is necessary for categorising the generation/attraction facilities into different weight classes based on demand, a questionnaire was developed and administered to the respondents selected from the six (6) Schools/Faculties of the University. A total of 300 questionnaires were administered to with 197 copies returned giving a 65.7% return rate. The selected respondents were mostly students and staff members that depend on campus commercial shuttles for transportation using a Stratified Random sampling method.

Data Processing and Analysis Methods

In order to make the collected data relevant for the modelling there was the need for processing the acquired datasets. This was carried out using the ArcGIS 10.3.1. The processing was carried out in

phases starting with image registration otherwise known as Geo-referencing. Geo-referencing is the process of assigning real world coordinates to each pixel of the image. Coordinates of points collected from field survey were used to register the image. Thereafter, since the satellite image used for this study covers an area larger than FUTA boundary, it was clipped to FUTA boundary to represent the only areas needed for the study. The next phase was to vectorise features (roads, walkways, car parks and trip-generating facilities) relevant for the modelling. This was carried out by creating the relevant feature classes (points, lines, and polygons) which were vectorised by the method of on screen data capture which is similar to the conventional digitizing technique. Rather than using a digitizer and a cursor, the user created the map layer up on the screen with the mouse and traced out the necessary information from previously digitized scanned information or images. The existing shuttle stops locations whose coordinates were acquired using the handheld GPS were plotted as point feature classes and overlaid on the map. Thereafter, attribute data to every feature was added. Attribute data are the information that describe geographic features which had been collected and prepared into the feature class attributes table. They are names of features such as buildings, roads, shuttle stops, number of floors in the buildings and details about the use of buildings. Furthermore, the data collected through questionnaires were collated and entered in SPSS for the purpose of analysis.

Results and Discussions

For optimum spatial modelling of the distribution of FUTA campus shuttle-stop locations, a map showing the eight (8) existing shuttle stops in FUTA campus was developed. The first output of the data acquisition and processing phase is the map as depicted in Figure 2.

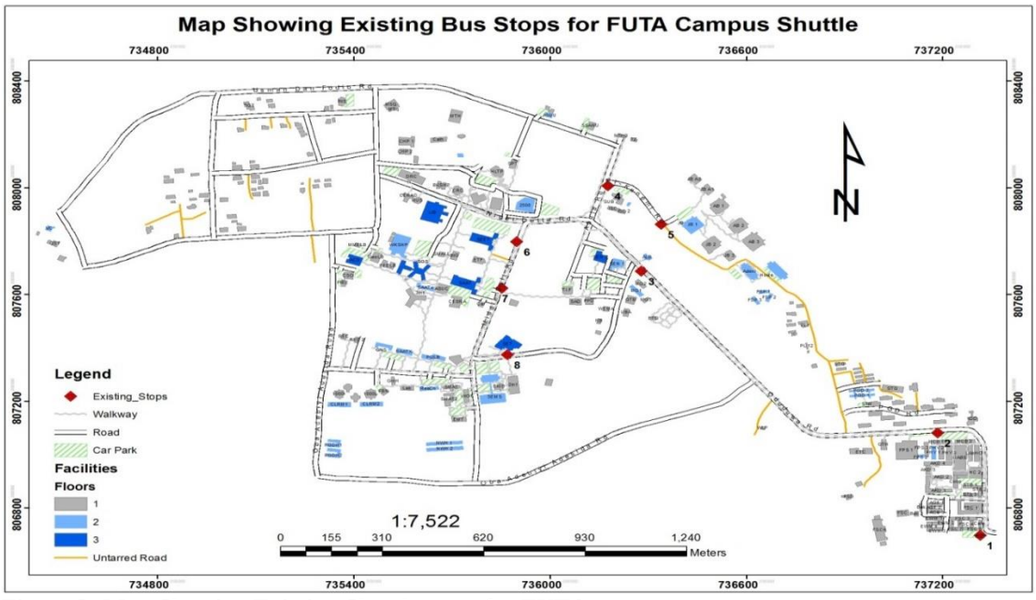

Figure 2: Map Showing Existing Shuttle stops for FUTA campus
Source: Authors' fieldwork (2017)

Shuttle Stop Modelling

The first stage in the modelling was to locate potential shuttle stops which are prospective points to locate a shuttle stop subject to further analysis. As shown in Figure 2, potential points were selected to cover the entire study area and this comprised of twenty (20) potential shuttle stop locations with approximate 300m spacing considering shuttle stop spacing range specified in Table 1 and other factors to consider in locating a shuttle stop (e. g. catchment area, safety, intersections etc). Potentially located shuttle stops were then located on the map and given Unique IDs 1-20 for easy identification as shown in Figure 3. These were later subjected to further analysis to determine points to be accepted and discarded.

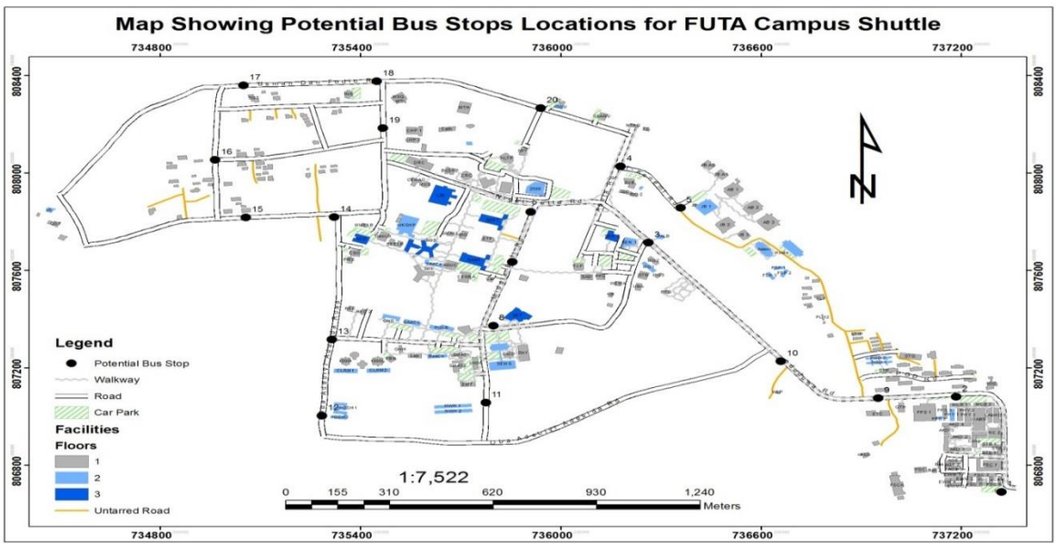

Figure 3: Potential shuttle stop locations for FUTA campus
Source: Authors' fieldwork (2017)

Further analysis was carried out in order to determine the accepted shuttle stop locations out of the proposed ones. The first stage was the analysis of the shuttle stop with respect to the demand generators (facilities). In order to achieve this, a 4 point likert scale measurement was used to apportion weight to the various choice options for the respondents based on their perceptions of their demands for the facilities being measured. The demand for facilities was categorized to fall into four classes: Very high demand (4), High demand (3), Medium demand (2) and Low demand (1). After processing the questionnaire using SPSS, a percentage response table on the level of demand for facilities was deduced as shown on Table 2. The facilities were later categorised to fall into four demand classes based on their highest percentage score (highlighted in Table 2) as shown on Table 3. The assigned weight values on Table 3 was used in computation of weight attributed to each shuttle stop based on demand for facilities within specified buffer radius.

Table 2: Percentage response on the level of demand for facilities within FUTA

Facilities	Very High Demand (4) %	High Demand(3) %	Medium Demand(2) %	Low Demand(1) %	Total
Admin Building	9.4	31.7	42.3	16.6	100
Classrooms	57.7	25.0	13.2	4.1	100
Farmland	8.0	18.3	20.7	53	100
Laboratories	46.9	31.6	16.3	5.2	100
Lecture Halls	60.8	19.8	16.0	3.4	100
Lecturers Offices	21.7	25.9	33.5	18.9	100
Public Spaces	27.8	35.1	23.2	13.9	100
Religious/Worship Ctrs	22.7	38.1	28.9	10.3	100
Staff Residential	6.8	23.6	20.2	49.4	100
Students Hostels	58.1	21.5	11.4	9.0	100

Source: Authors' fieldwork, 2017

Table 3: Classification of Trip-Generating Facilities based on Demand Weight

Land Use Class	Assigned Weight
Staff Residential, Farmland	1
Offices, Admin Building	2
Religious/ Worship Centers, Auditorium, Public Space (Banks, Sports Facilities, Business centers etc.)	3
Laboratory, Hostel, Classroom, Lecture Hall	4

Source: Authors' fieldwork, 2017

The weight assigned to each shuttle stop based on demand from facilities within 200m and 400m buffer was computed using equation 1 which is the summation of the computed individual weights of individual facilities within the specified buffer. The weights of individual facilities were computed using equation 2 being the product of facility floor area (F_a) derived from the calculated geometry of ArcGIS, number of floors (F_n) which is a field in the attributes of the facilities and weight value assigned (L_w) based on table 3

$$\boldsymbol{B_w} = \sum \boldsymbol{f_w} \quad \textbf{1}$$

$$f_w = F_a \times F_n \times L_w \quad \textbf{2}$$

The field calculator command of the ArcGIS was then used to implement equation 2 which computed values registered as a new field as attribute data for the facilities and select by attribute and location tool of the ArcGIS was used to implement equation 1 which were used to determine the facilities contained within the specified buffer as well as the sum of their predetermined weight attribute the outputs were registered in a field of potential shuttle stop attributes. Finally the created graph tool of the ArcGIS was used in plotting the bar chat of the Shuttle stop weight against the potential shuttle stop ID at 200 and 400m buffer as shown on Figure 4 and 5 respectively.

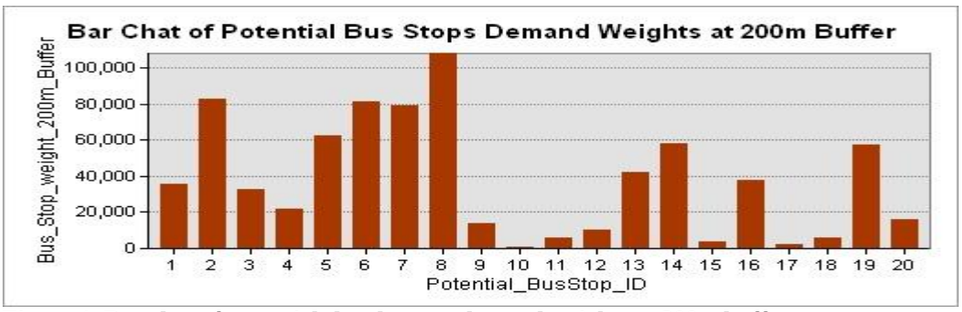

Figure 4: Bar chat of potential shuttle stops demand weights at 200m buffer
Source: Authors' fieldwork (2017)

Figure 5: Bar chat of potential shuttle stops weighted demand at 400m buffer
Source: Authors' fieldwork (2017)

The chats in Figures 4 and 5, shuttle stop locations flow chat in Figure 1 and the map showing the existing and potential shuttle stops on Figurers 2 and 3 were used to further analyze the potential shuttle stops locations. These led to the selection of the final thirteen (13) proposed shuttle stop locations in FUTA as shown in Figure 6. Amongst the thirteen (13) locations, eight (8) existing shuttle stop locations shown in Figure 2 were included with little modifications (i. e. slight shifts) in the locations of shuttle stops 5 and 8. These existing shuttle stop locations were selected due to high values of their weights as indicated Figures 4 and 5 and considering other necessary factors for locating a shuttle stop which yielded positive results in their favor. The remaining five (5) shuttle stops locations include proposed shuttle stops 13, 14, 16, 19 and 20 whose IDs were later renumbered as proposed shuttle stops 9, 10, 11, 12 and13 respectively as shown in Figure 6 and Table 4.

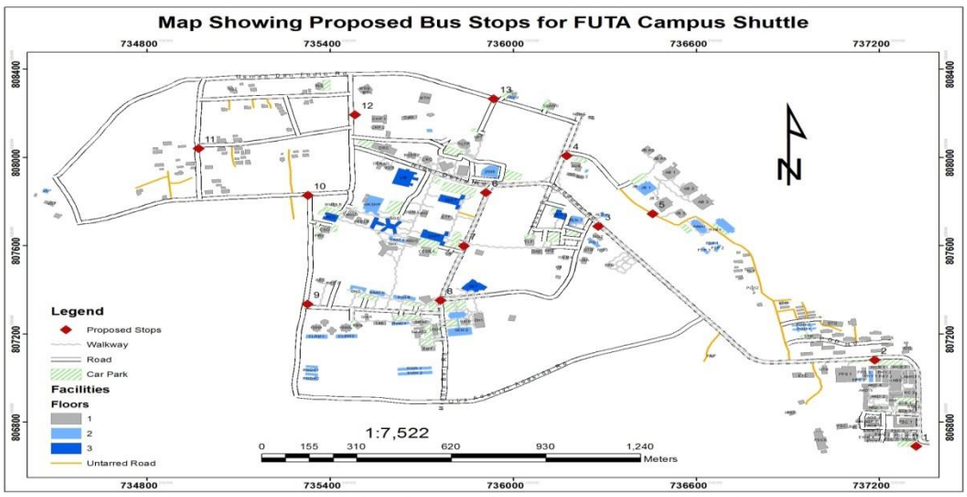

Figure 6: Map showing proposed shuttle stops for FUTA campus shuttle
Source: Authors' fieldwork (2017)

Table 4.0: Some attributes of proposed shuttle stops for FUTA campus shuttle

Shuttle Stop ID		Facilities within 200m Buffer		Facilities within 400m Buffer		
Proposed	Potential	No of Facilities	Cumulative weight	No of facilities	Cumulative weight	Remarks
1	(1)	23	43807	45	122910	Existing
2	(2)	34	93891	75	155037	Existing

3	(3)	11	32646	45	146931	Existing
4	(4)	8	21569	35	137868	Existing
5	(5)	12	62364	43	150009	Existing(modified)
6	(6)	18	158019	40	294063	Existing
7	(7)	10	121661	45	366883	Existing
8	(8)	13	110479	35	273672	Existing(modified)
9	(13)	14	42068	23	91967	New
10	(14)	13	146887	55	275607	New
11	(16)	29	37467	52	112903	New
12	(19)	13	24963	54	124780	New
13	(20)	7	15895	34	95653	New

Source: Authors' fieldwork, 2017

Proximity Analysis

Proximity analysis of the newly proposed shuttle stop locations to the facilities was carried out on a 200m and 400m buffer. A total of 276 facilities were identified within the study area and result of the analysis as indicated in Figure 7 shows proposed shuttle stop locations with a 200m and 400m buffer overlaid on the map. Also, Table 5 shows the total facilities covered at 200 and 400m buffer for the proposed shuttle stops. Based on Table 5 and Figurer 7, it can be inferred that the proposed shuttle stops have a higher proximity to facilities and passengers as compared to the existing.

Table 5: Coverage of existing and proposed Shuttle Stops

	No of Facilities Within 200m Buffer	No of Facilities Within 400m Buffer	coverage @ 200m Buffer	coverage @ 400m Buffer
Existing Shuttle stops	103	175	31.32%	63.41%
Proposed Shuttle Stop	191	268	69.202%	97.10%

Source: Authors' fieldwork, 2017

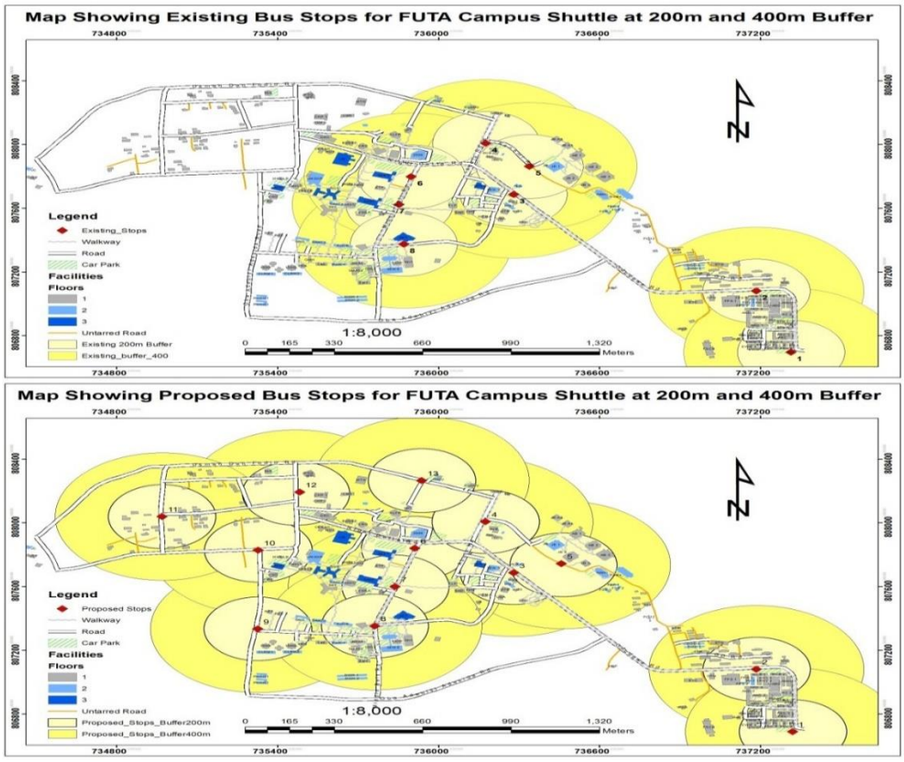

Figure 7: Map showing 200m and 400m buffer for existing and proposed shuttle stops respectively
Source: Authors' fieldwork (2017)

Spatial Distribution Analysis

Spatial cluster analysis was used to explore the distribution of shuttle stops within the study area using the average nearest neighbour technique. Average nearest neighbour tool of the ArcGIS measures the distance between each feature centroid and its nearest neighbour's centroid location and averages all these distances. If the average distance is less than the average for hypothetical random, the distribution of the features being analysed is considered clustered. If the average distance is greater than a hypothetical random distribution, the feature is considered dispersed. The features were considered and the average nearest neighbour ratio was calculated as the observed average distance divided by the expected average distance (with expected average distance being based on a hypothetical random distribution with the same number of features covering the same total area).

The average nearest neighbour tool returns five values: observed mean distance, expected mean distance, nearest neighbour index, z-score and p-value.

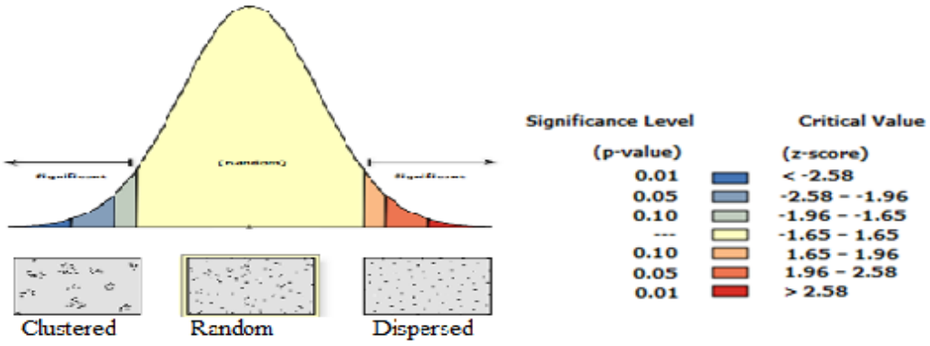

Figure 8: Spatial distribution of shuttle stop
Source: Authors' fieldwork (2017)

Table 6: Average nearest neighbor Analysis summary

	Existing Stops	Proposed Stops
Observed Mean Distance:	251.1803m	323.8780m
Expected Mean Distance:	194.4792m	230.7860m
Nearest Neighbor Ratio:	1.291554	1.403369
z-score:	1.577590	2.988680
p-value:	0.114660	0.002802

Source: Authors' fieldwork, 2017

Table 6 is the summary of the average nearest neighbour analysis carried out to analyse the spatial distribution of the existing and proposed shuttle stop distribution. Figure 8 shows the p-value and z-score range for clustered, random and dispersed spatial distributions. For existing shuttle stops, with p-value of 0.114660 and z-score of 1.577590 indicates a random spatial distribution while for the proposed shuttle stop, with p-value of 0.002802 and z-score of 2.988680 indicates a dispersed spatial distribution.

CONCLUSION AND RECOMMENDATIONS

Shuttle stops are important components of urban transportation as it forms the basis for commuting from place to place. It is important for its location and distribution to be modeled carefully as a poor model could lead to difficulties in transportation. Modeling shuttle stop locations within FUTA was carried out using Geo-information technology considering several factors such as optimum shuttle stop spacing, demand generators, passenger safety, intersections, catchment area etc. Based on this modelling, thirteen (13) optimal shuttle stop locations were proposed for FUTA campus shuttle consisting of eight (8) existing locations with little modifications and five (5) new locations. To assess the improvement of the proposed over the existing shuttle stops, proximity and spatial distribution analysis were carried out. Based on proximity analysis of the proposed shuttle stop locations, an improvement was observed in the facility access to shuttle stops indicated by 69.2% and 97.1% facility coverage at 200m and 400m buffer respectively for proposed shuttle stops over 31.2% and 63.4% facility coverage at 200m and 400m buffer respectively for existing shuttle stops (see Table 5). Considering the spatial distribution analysis, p-values and z-scores for existing and proposed indicated that the proposed shuttle stops exhibits dispersed spatial distribution and existing shuttle stops exhibits random spatial distribution. The dispersed spatial distribution exhibited by the proposed shuttle stop represents a nearly equal spaced distribution pattern which is best suited for shuttle stops in urban and sub-urban development (AASHTO, 2014).

Based on this study, the following recommendations were made:

1. Five (5) additional new shuttle stop locations should be established in FUTA and the locations of two (2) existing ones be relocated to their respective proposed locations to easy intra-campus commuting.
2. There is a need for revision of shuttle stop locations from time to time for FUTA campus shuttle as the university continues to expand in terms of infrastructure and population.
3. Further studies are recommended within the university involving implementation of Geospatial techniques in areas of water supply schemes, electric power distribution and waste management systems.
4.

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USERS' SATISFACTION OF TRICYCLE AS URBAN COMMERCIAL TRANSPORTATION IN MINNA, NIGERIA

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This study analysed the satisfaction that the tricycle users derive from the use of tricycle as a means of urban commercial transportation in Minna, central Nigeria. The core objectives of analysing users' and operators' satisfaction and providing recommendations for enhanced satisfaction revealed that tricycle as a means of urban commercial transportation is yet to meet the main requirements of the users as problems such as avoidable delays, longer time travel, discomfort, lack of access and on-transit discomfort with excessive noise are still being faced. Although, it was shown that operators derive high occupational satisfaction with the mode of transportation, it has little to do with ease of accessing the vehicles, comfort of usage, and the needed cooperation from other road users, passengers, law enforcement agents and even the revenue mobilization. This study utilized cluster sampling on the major traffic routes and bus terminus in the study area to generate primary data. Physical and socioeconomic surveys of major transit routes in Minna metropolis, intensive physio-economic analyses and interview of passengers, tricycle operators, and other road users, this study recommended the provisions of a more reliable, affordable, safe, comfortable, secured and satisfactory mode of commercial transportation in Minna. However, tricycles are recommendable as urban commercial transportation on certain routes, particularly with road rehabilitation, provision of additional road furniture, public enlightenment, gradual enforcement of peculiar traffic rules and regulations, in addition to training and re-training of tricycle operators to reduce the observed anomalies and increasing rates of accidents and on-transit discomforts.

Keywords: Affordability, Comfort, Poverty alleviation, Tricycles, Urban management, Urban mobility

1.1 INTRODUCTION

Transportation is one of the basic needs of life and the builder of cities and nations. Transportation can only exist efficiently if it successfully moves people, goods, and information (Mabogunje, 2008). Hence, the term transportation is often seen by many as the movement of people, animals, goods and information from one location to another and it is one of the basic human needs. Transportation is paramount to human existence because all of life's necessities and pleasures cannot possibly fit within the reach of our static body. It is either we have to move ourselves to things or have things moved to us. The provision of transportation facilities is very crucial to the economic, political, social and cultural life of a country (Akinbabi & Fadare, 2008) as it enables trade between people which is essential for the development of communities and nations (Elbert, 2006). Urban transport system provides access and mobility for people and goods, linking origins and destinations both internal and external to the areas of interest, and also responds to well-designed economic policies geared towards accomplishing improved urban life. Public transportation is an integral backbone of urban life and it's also one of the factors which determine the form and socioeconomic development of a cities (Santhumar, 2003).

The importance of public transport stemmed from the fact that it provides mobility for those who cannot afford to buy personal car and helps in creating and maintaining liveable communities by relieving highway congestion and assuring long term sustainability in terms of resource consumption and safe environment (Paul, 2001; Oni, 2003).

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The acknowledgement of the importance of transportation has led to the research of the different modes of transportation including the tricycle. People use different means of transportation in order to move from one place to another but the satisfaction, derived, in newly introduced mode is the topmost priority of many researches. Besides enriching the number of available modes, it is also important to ascertain users' and operators' satisfaction in using this mode of transportation in bourgeoning cities.

The Research Issue

Cities are locations having high levels of accumulation and concentration of economic activities supported by transport systems. The most important transportation problems are often related to urban areas and takes place when transport systems, for a variety of reasons cannot satisfy the numerous requirements of the people (Rodriguez, 2013). The use of tricycles as means of commercial transportation has become the dominating and readily available means of public transportation in Minna, Niger Sate. Prior to this, motorcycles were chiefly used for similar activities until this was banned following several attempts by the authorities to curtail their incessant misuse.

Tricycle is a popular new mode of transport even in affluent industrialized cities like Osaka, Japan, where it is reported that about 250,000 people use tricycles in their daily movement to work. This movement is normally by commuting to train station and on return in the evening commute back to the city by tricycles. The city has also built parking facilities for 51,000 tricycles at 90 stations and planning to build more (Replogle, 2004). However, the use of tricycle for city transportation is important within and outside a city, but not without its own emerging transportation problems ranging from parking terminals, time delay, unequal fair charges, passenger and goods overloading, pollution, and so on. In Nigerian cities, the high rate of car ownership and other transportation services has not been able to solve the increasing rate of transportation demand as such the need to meet up with this demand has led to the introduction of other paratransit services especially tricycles (Bolade, 2007; Mabogunje, 2008a).

This research analyses the extent of satisfaction in which the users of this mode of transportation derive from the common and readily available means of commercial transportation within Minna. This was achieved by identifying and examining the: benefits of tricycle as urban commercial transportation, the challenges of tricycles as means of urban commercial transportation; users' satisfaction of tricycle as means of urban commercial transportation; and, enlisting physical planning approaches for the use of Tricycles (popularly known as Keke-NAPEP) for sustainable urban commercial transportation in Minna and similar cities.

Extent and Justification of the Study

The study will observe the positive and negative impacts, which will then determine if it is a satisfactory means of public transportation. The aerial extent of the study is limited to the core areas of Minna town that include Tunga, Maitumbi, Mobil, Bosso, Kpakungu, Dutsen-Kura and Barkin-Sale). The peripheral neighbourhoods of Minna, such as Gidan kwano, Gidan mangoro, Maikunkele, are excluded as commercial tricycle are less committed to long distances or function as intercity means of transportation.

Studies have been conducted on urban transportation in relation to planning of transport services ((Mabogunje, 2005, 2008a; Mabogunje & Kates, 2004; Muktari & Kawu, 2013)). However, less attention is paid to users' precise satisfaction and expectations; leading to inadequate information for effective policy formulation, and or implementation without the users' perception, involvement and considerations. Detailed studies will provide useful inputs in the measurement of the performance of public transport systems like the tricycle services by the documentation of users' satisfaction particularly in terms of its affordability, reliability, availability, manageability, and security.

Concept of Urban Transportation

Urban transportation issues are important to support the passengers and freight mobility requirements of urban agglomerations of the present urban century. Transportation in urban areas is complex because of the various modes involved, the multitude of origins and destinations and also the increasing amount of traffic as cities experience further growth and expansions in all directions. The focus of urban transportation has for long been on passengers as cities were viewed as locations of utmost human interactions with intricate

traffic patterns linked to commuting, commercial transactions and other similar activities (Rodrigue, 2013). Urban transit is an important dimension of mobility notably in high-density areas (Mabogunje, 2008b; Rodrigue, 2013). Sustainable mobility in towns and cities means creating safer, cleaner and more efficient and effective transport systems that is crucial for sustainable economic and social development.

Public transportation is a crucial part of the solution to nation's economic, energy and environmental challenges by helping to bring a better quality of life. Every aspect of the society benefits from public transportation. A key instrument for optimising the transport sector is the integration in traffic planning which considers the needs of the population, pay attention to the public and private sector of transportation, health and environmental concerns (GIZ, 2009).

Urban transport systems provide access and mobility for people and goods, linking origin and destinations both internal and external to the urban areas. It has many elements including public transport (collective transport), non-motorized transport (pedestrians, cyclist) freight and business traffic. The targeted objectives for urban transport are to fulfil the demand for accessibility with efficient and quality service, while at the same time promoting sustainable patterns and levels of traffic that take account of economic, social, environmental and safety concerns. Effective urban transport systems are essential to economic activity and the quality of life. They open up opportunities to access essential services as well as social and leisure activities.

Benefits of Urban Transportation

Public transportation has helped to enhance personal opportunities by providing mobility and freedom for people from every aspect of life. It gives people transportation options to get to work, schools, and visits. In general, it allows easy conveyance of people to job opportunities and livelihood places, reduce congestion, enhances affordability and also reduction in pollution generated from continuous use of multiple modes of transportation (APT, 2015).

Prospects of Urban Transportation Systems in Nigeria

As cities become the engines of economic growth and development, city officials and professionals in decision-making faces serious challenges of developing and maintaining efficient urban transport systems. Coupled with these are the complexities of urban systems that makes choosing the right strategy for many transport professionals a difficult task. As urban transportation stimulates and improves human existence and reduces man's trip (Akinbabi and Fadare, 2008), the type of available transport and how they are used tells a great deal about a society and its values (Oni, 2003).

Several social, environmental and economic problems affect the transportation systems in Nigeria. However, inadequate planning and coordination, and continued concentration of transport development on intra and intercity linkages and the relative neglect of rural transport, have largely received much attention by many studies.

Urban transports remain one of the most common problems of transportation in Nigeria today. The activities present in the urban areas have led to the increase in population, thereby resulting to social and environmental problems (Aderamo, 1998). Road congestion tends to occur when the demand of transportation is more than the supply. Due to the problem of congestion the problem of parking becomes difficult to effectively handle as a result of the unavailable space (Kombs, 1998). In addition to congestion, is the issue of increasing occurrence of road accidents that are mostly the result of general impatience and nature of the road users, conflict between pedestrians and the different means of road transport in cities (Ogusanya, 2013).

As a result of these problems, there is urgent need to engage professionals in achieving functional, responsive, and sustainable transport system in Nigeria; which is the objective of a sustainable urban transportation: to maximize the use of transportation system to achieve economic and related social and environmental goals without sacrificing the ability of future generations to do so (Spaethling, 1996). Hence, the increasing need to assess users' satisfaction and to also enlightened the public on best practices like regular maintenance of vehicles, good driving habits, use of alternative energies and low emission (Oni, 2002).

Elements of Urban Transportation Users' Satisfaction

Satisfaction is an important concept in the context of life in understanding users' perceptions (Oliver, 1997 & 2007). Satisfaction studies can provide decisions makers with information about what customers or users consider to be important as well as information about how the existing public transport service, for example, is perceived. User satisfactions therefore, highlight and explain the link between what an organisation do and how its customers react. For public transport, this link is a key concern as major investments are being made in public transport systems in other to make them more competitive.

Previous studies in public transport (Frima, Edvason and Gardling, 2001) have shown that employee behaviour is an important consideration for the traveller. Hence, the need for users' satisfaction being put forward as key to the future development of public transportation both in theory and practice. In the transport research, satisfaction is sometimes looked upon from a policy perspective (Hensher, 2007). When improvements in the public transport system are to be evaluated attributes like reliability, comfort, frequency, information, driver behaviour are shown to be the key elements of public transport user satisfaction (Bates, Beiro, and Cabral, 2007). These and similar studies have made significant contributions to the understanding of what public transport satisfaction is and what is actually satisfying (Richter, 2008).

In many countries, there are major investments in public transport systems to make them more competitive vis-à-vis other means of transport like use of private cars (Fujii and Kitamura 2003, Mackett and Edwards 1998). To make sure that investment really attracts both the existing and the potential customers envisaged, knowledge of satisfaction and service performance (Edvardsson, 1998), should provide policymakers and operational managers in public transport with valuable information (Nathanail 2007).

Customer satisfaction is an ambiguous and abstract concept and the actual manifestation of the state of satisfaction will vary from person and product or services. The state of satisfaction depends on a number of psychological and physical variables, which correlate with satisfaction behaviours such as return and recommend rate. In researching satisfactions, firms generally ask customers whether their product or service has met or exceeded their expectations. When customer have high expectations and the reality falls short, they will be disappointed and will rate their experience as less than satisfying. Expectations of a customer on a product state his anticipated performance for that product (Edvardsson, 1998).

User's satisfaction is the best indicator of how likely a customer will make a purchase in the future, it plays an in depth role by measuring and indicating user loyalty, unhappy customers, and increase revenue. It is a key point of differentiation that helps to attract new customers in competitive business environments. Experts have pointed out that the development of urban transportation system requires a strategy to improve the performance of public transport in other to meet the satisfaction of the users. The level of interest and needs of people differs due to various activities the population engages in, and as such the transportation system planning. This is because interest and needs should be known because the need of the public transportation users differs and changes over time (Moseley, Marzano, Chetcuti, & Watts, 2013; Nwaogbe, Ibe, & Ukaegbu, 2012).

Evolution of Tricycles

A Tricycle is a three-wheeled passenger vehicle carrying a single rider. In the developing countries of Africa and Asia, tricycles tend to be used for commercial purposes such as minicab for transporting passengers and for making deliveries. Historically, a three-wheeled wheel chair was built in 1789 by two French inventors and propelled by pedals they called it the tricycle. In 1877, Starley developed a new vehicle called the Coventry Rotary which was one of the first rotary chain drive tricycles. By 1879 there were twenty types of tricycles and multi wheel cycles produced in Coventry England and by 1884 there were over 120 different models produced by 20 manufactures. The first steering tricycles were manufactured by the Leicester safety tricycle company in England (Mohl & Rose 2011).

The passenger tricycle also known as the cycle rickshaws, used for carrying passengers, are tricycles with one steering wheel in the front and two wheels in the back supporting a seating area for two to four passengers. The cycle rickshaws often have a parasol or canopy to protect the passengers from sun and rain. These tricycles are often use in developing countries where it normally provides essential employment for immigrant from rural areas. Rickshaws have also become popular in developed countries like the Britain, England and

United States where they provide urban transportation, novelty rides and advertising media (Plate I & II).

Plate I: A Passenger Tricycle
Source: Sun (2009).

Tricycles in Nigeria

The nationwide spread of tricycles in Nigeria is said to be attributed to the federal governments initiatives in 2002 to ease urban transportation problems and create access for self-employment (Sun, 2009). This commercial tricycle, locally called "Keke-NAPEP" or 'Keke-Marwa'. Keke been a native word for a bicycle or tricycle while NAPEP is an acronym for National Poverty Eradication Programme (Josiah, 2008), and used as a poverty eradication intervention by the NAPEP. With unplanned increases in urban population, it is obvious that there is impending mobility crisis arising from the ever-expanding demand and supply gap. The emergence of various modes of transportation gave rise to tricycle especially in view of its flexibility and the need to cope with the emerging socioeconomic trends. The tricycles are popular among commuters due to their high accessibility, availability, affordability and sometimes door-to-door services (Sun, 2009).

Tricycles provide numerous services which include door to door movement in a city, and as a tool for earning sustenance and employment for young and old, both skilled and unskilled men, many of whom have migrated from rural areas (Vuchic 2005; Duarte et al. 2011). This tricycle transportation sub-sector, employs not only drivers, but provides jobs for vehicle maintenance and production units (Fujii & Kitamura, 2003; Nwaogbe et al., 2012).

Plate II: Tricycles awaiting passengers in Aba
Source: Sun (2009)

Overall, the use of tricycles has been supportive in employment generation; reduction in the rate of urban road accidents and the cumulative social and economic cost these unreached, unrealized and resource consuming expenses on the teaming urban masses by providing a cheaper means of transportation which reduces stress on urban road and livelihood activities.

METHODS

The Study Area

Minna, the administrative capital of Niger Sate, central Nigeria, is located on Latitude 9˚ 37'N and Longitude $6^0 33^/$E (Longman, 2003; FUTMinna, 2008 and 2013) and bordered by latitudes $9^0 33^/$ and $9^0 42^/$ to the north and longitudes $6^0 27^/$ and $6^0 35^/$ to the east (Googlearth, 2012; Kawu, 2016). The mainly administrative settlement is 130km North-West of the Federal Capital Territory (FCT), Abuja. With an increasing population of over 319,618 and land size of 884 hectares, the metropolis can presently be said to have grown to engulf suburb settlements of Bosso, Maitumbi, Dutsen-Kura, Shango, Kpakungu, and Chanchaga areas (Lock, 1980; NPC, 1991 and 2010).

This work utilized first-hand information gathered by the researchers on the field constituting physical observations, taking of physical measurements, interview of users and operators of tricycles and the administration of structured questionnaires; forming primary data for the research. The secondary data are from published and unpublished documents including books, magazines, academic journals and theses, and, official documents and manuscripts from government ministries and institutions.

Using cluster sampling, fourteen (14) most populous and strategically located tricycle terminals at Tunga, Mobil, Maitumbi, Bosso, Kpakungu, Dutsen-kura, and Barkin-sale were sampled to represent the study area. A total of 280 structured questionnaires were also used; that is, Twenty (20) sets of questionnaires at each sample point (Figure 1.3). Field data were analysed through the responses acquired from personal observations, oral interviews and particularly questionnaire administration.

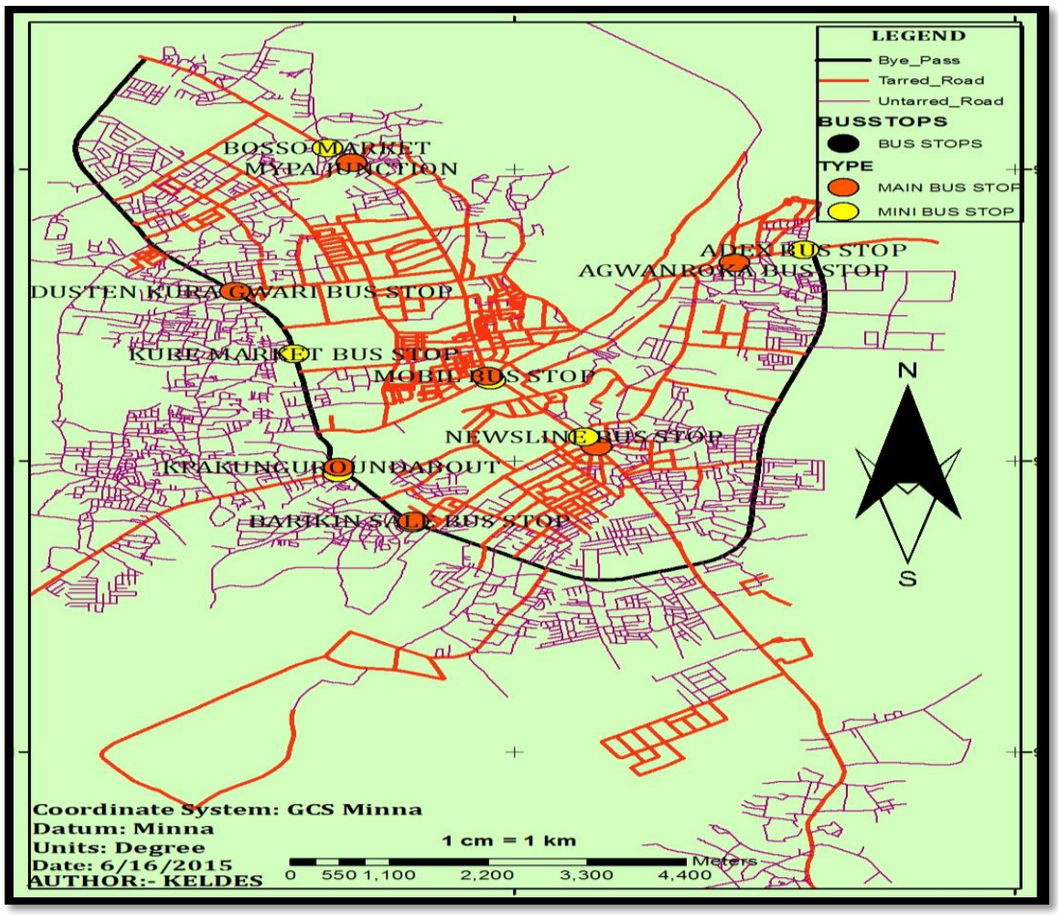

Fig. 1.3: Road Networks and Sample Points of Tricycles in Minna
After: Google Earth, June 2015

RESULTS

The Respondents

Most of the users of tricycle are relatively young with about 35% of them bellow the age of 30 and over a quarter (26.07%) between the ages of 30-39 years. Those between 55 and above 60 constitute only 10.8%. The female users dominate the respondents constituting

almost 60% **(**59.7%). Educationally, tricycle users are largely literate with average literacy level of highest education qualification being secondary school levels. The service is largely supporting students (34.3%), traders (29%), and the unemployed (15%), as the main users of tricycle in Minna.

Major Means of Urban Transportation

Tricycle usage dominated all other means of public transportation and constituted half of the available medium to users in Minna. Taxes and motorcycles having 20% each (Figure 1.4) follow this. The various benefits derived from using tricycle as a mode of urban commercial transportation in Minna include employment generation and enhancing livelihood constituting over 63%, and assistance in educational pursuits is attested by another 23% of the respondents.

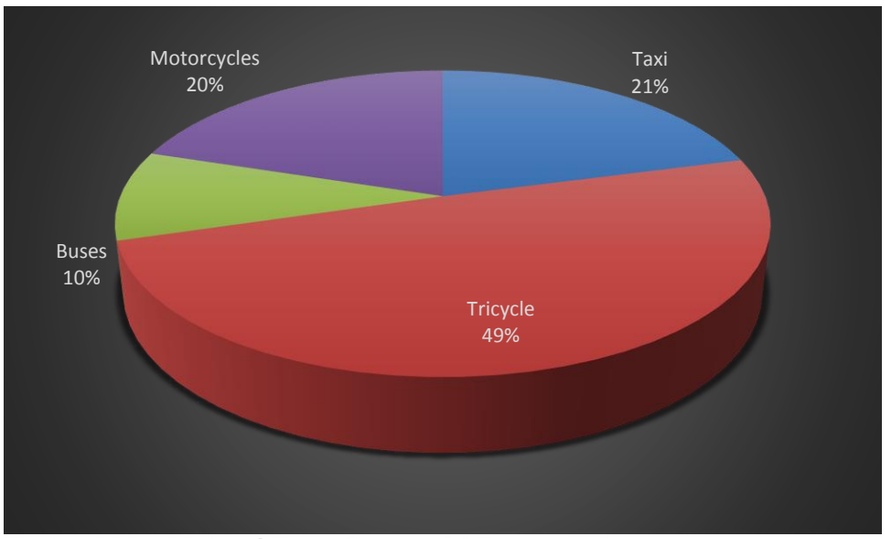

Fig. 1.4: Major Modes of Urban Commercial Transportation
Source: Field Surveys, June 2015

The gains from tricycle usage has made many urban residents agreeing to making it a permanent means of public transportation in Minna, due to its peculiar occurrence of drastic reduction in urban transport accidents, being a major source of income, job creation and also a convenient means to use. That, the only shortcoming is lack of high patronage, high taxation, time wasting, and high cost of purchasing the vehicle.

Assessing Components of User's Satisfaction of Tricycles

Over 73% of the respondents confirmed that tricycle is a cheap and affordable means of transportation, with another over 74% attesting to the safety of this means of public transportation. About half of the respondents also indicated that tricycles are readily available for use and always have close proximity to users' destination or residence.

According to the result of detailed survey and physical assessments over 70% of tricycle user assessed the cost of a ride as cheap and anyone can easily afford the fee. The majority of the respondents about half (47.99%) are okay with it saying its safer to use than the former mode of tricycle which is motorcycle, with only 19% still not pleased with the safety provisions.

The respondents are however, not satisfied with the travel time of tricycle and the insistence by the drivers that the Tricycle must be filled to capacity before it takes off from the park or terminal. Time wastage and instances of non-availability are the major complains about the Tricycles as they are often not readily available within certain localities. The interiors components are not giving this means of transport a good record as over 52.75% of the respondents were not satisfied with the loud noise from the Tricycles and the Exhaust fumes that make riding in the Tricycles less comfortable (Figure 1.4).

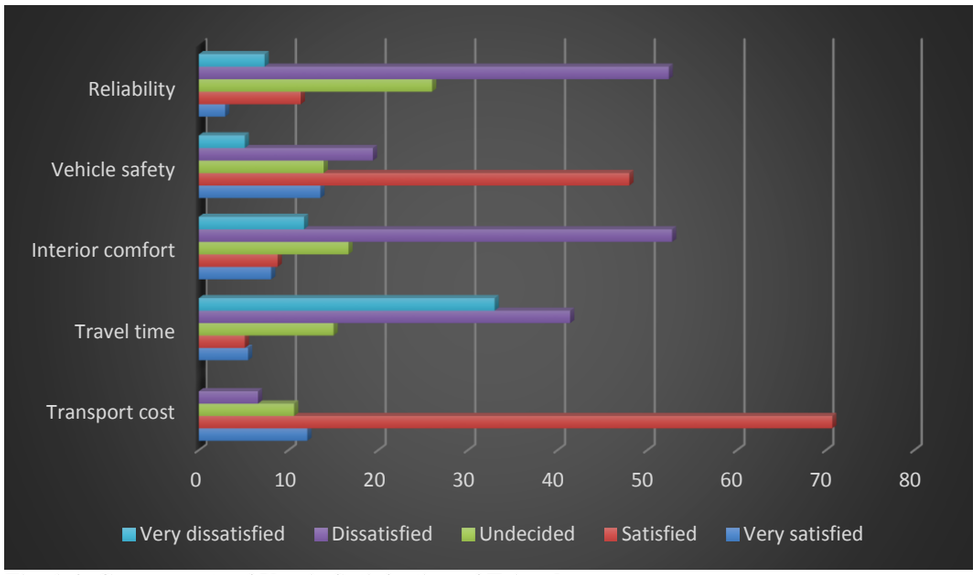

Fig. 1.4: Components of User's Satisfaction of Tricycles
Source: Field Surveys, June 2015

The occurrence of road accidents while using Tricycles is quite rare. From a total of 280, only 85 respondents have witnessed road accident while using tricycle as a means of public transportation. From this figure, 28 of the respondents viewed the accidents as fair without any body injuries, 48 as with minor body injuries while only 9 of the respondents have witnessed Fatal Accidents.

Challenges of Using Tricycle

Field surveys data shows that the major problem is time wasting, bad driving habits with little or no regard to other road users, and pollution by the loud noise and exhaust fumes from vehicle engines. Time wasting accounted for the main reason (22.9%) for not accepting tricycle as the main public transport in the study area. Others include; the unbearable noise, which it produces, issues of pollution, and traffic congestions it sometimes causes on the roads.

In addressing these issues, field respondents stressed the need for adequate provision of regulations and training for both tricycle operators and law enforcement agents in order to reduce the bad driving habit among the urban road transporters and users. The supply of more tricycles will also help solve the challenges of non-availability especially in areas where they are critically in need.

These suggestions are crucial as only 28% still believes that tricycle is the best alternative and therefore agrees to make it a permanent means of commercial transportation in Minna. Further analyses show that this opinion is informed by a result of the reduction in the rate of urban road accidents, reasonable or affordable cost in term of usage, and a result of the job opportunity it has created for majority and meaningful improvement in their life.

RECOMMENDATIONS

With tricycle as urban public transport, the rate at which road accidents occur is lessened and rare compared to commercial motorcycles that were the previously dominant mode of public transportation in the study area. This has led to the call to make tricycle a permanent or official public transport in the growing city as it is affordable to users, and possesses high level of safety as accidents rarely occur.

i. There is the need to provide more tricycles to increase access, provision of designated parking spaces and more parking facilities in the few existing ones in order to reduce on street parking and the associated road congestions.

ii. In order to avoid road congestion by additional road infrastructure for smooth functioning of tricycles, urban roads should be upgraded and those that need maintenance should not be overlooked.

iii. The collection of taxes by government agents need to be planned, more organized and well-coordinated in order to avoid multiple taxation and the constant daily harassment operators and users of tricycle are facing.

iv. There is the need to regulate waiting time for operators of tricycles to take-off from terminals and parks in order to reduce time wastage that is now a major drawback for the use and preference of this essential service.

v. Proper training need to be giving to the operators of tricycles in order to avoid problems of bad driving and heavy fines levied on those who contradict this law.

vi. There is also the need for the constant and continuous investment in the transportation sector which will meet the satisfaction of the user and also increase healthy competition amongst urban commercial transportation modes.

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THEORY AND PRACTICES FOR COST EFFECTIVENESS IN CONSTRUCTION INDUSTRY

ASSESSING THE PERFORMANCE TREND OF QUANTITY SURVEYING STUDENTS IN CORE QUANTITY SURVEYING COURSES IN SELECTED TERTIARY INSTITUTIONS IN NIGER STATE

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This study assessed the performance trend of Quantity Surveying students in Core Quantity Surveying courses in Tertiary institutions offering the course in Niger State. The number of students who applied Quantity Surveying as their first choice was analyzed, the performance trend over a period of six years was studied and factors affecting the performance of students were studied. This research adopted the descriptive method of data analysis and data on the academic performance of students were collected over a period of six academic sessions. Questionnaires were administered to the students in all the institutions studied to get their opinion on the factors affecting the performance in the selected core courses. As such this research concludes that majority of students currently studying Quantity Surveying settled for it when their preferred course of study was unavailable Advanced Measurement, Civil Engineering Measurement and Heavy Engineering Measurement had the lowest academic performances of students when compared to other core Quantity Surveying courses in all the tertiary institutions in Niger State. Poor understanding of Construction Technology and Lack of interest is the main factor affecting students' academic performance as perceived from the analysis. In order to improve the performance in Measurement courses, more practical teaching methods should be adopted for example technical staff should often take the student to site to increase their constructional knowledge.

Keyword: *Academic, Assessing, Measurement, Performance, Quantity Surveying*.

INTRODUCTION

The principal activities of the client's Quantity Surveyor is the preparation of bills of quantities, according to Hore (2010) whileMcDonnell (2010) explained that the preparation of the Bill of Quantities for a particular project involves the measurement or "take-off" of quantities for various items of work from design drawings prepared by the project Architect and Engineer. The profession is concerned with detailed calculation and measurement of the materials and labour required for construction activities including building, and engineering project, has a multi-disciplinary nature (Opawole, Awodele, Babatunde & Awodele, 2012). The quantities are measured in accordance with a defined set of rules and definitions known as a "Method of Measurement". Lateron Samuel & Ejike (2015) pointed out that the responsibility of the Quantity Surveyor includes cost assessment, evaluation of economic and contractual arrangement of the project which is often significantly prejudiced by factors in the environment, and changes that are exclusive to an individual project which buttresses the vastness of Quantity Surveying as a profession.

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Performance as defined by Olanipekun (2014) is an observable or measurable behaviour of a person in a particular situation usually experimental situation; furthermore this same research deduced that performance measures the behaviors that can be observed at a specific period or over a specific period of time. A trend in these performance can be spotted and analyzed when closely observed for a period of time, assessment helps and shapes students' opinion towards learning and influences their motivation to learn, it provides vital information on students learning ability for easy accountability, internal programme, decision – making monitoring students' progress and helping them structure their learning (Stiggins, 2001). The Federal Republic of Nigeria Policy on Education (FRN) in 2004 emphasized so much on continuous assessment which is necessary at all level of education (Ani, 2014). According Samuel *et al* (2016), the diverse means of measuring students' success includes: Continuous Assessment (CA) and Examination, Grade Point Average (GPA), Graduation and retention rate etc. as the students' performance is very important as it appears to be the major criterion by which the effectiveness and success of any educational institution could be judged. Hence as stated in NUC (2012), the Nigerian Universities Commission has certain criteria's listed for accreditation of an institution some of which include, adequacy of teaching staff in numbers, competence and standard of instruction in all subject areas of the programme and the requirement for student graduation which is a satisfactory completion of minimum practical, core/ compulsory and elective courses stipulated in Bench Mark Minimum Academic standards (BMAS) among others.

Examination have widely been used to evaluate students' performance in formal school setting. At a higher education level, it helps to establish the integrity of the degree or certificate awarded by any school, college or university. This further explains that examinations are organized activities aimed at determining the cumulative or board knowledge in a student' educational development (Tobih, 2012).

In the Nigeria universities system, there are two mode of assessments: Continuous Assessment (CA) and Examination, used to determine the students' final grades. Therefore, Anikweze (2005) suggests that the purpose of test is to discover a Person's Performance under controlled circumstances, which leads to answering a number of questions either orally or written or perform a task or tasks within some limited time. Thus the examiners must not deviate from the objectives upon which the tests are based. Although, Pascarella & Terenzini (1991) cited in Rich (2006) and Akure (2016), found that most educators believe that effort is positively related to performance.

In a research carried out by Akure (2016) it was deduced that Civil Engineering Measurement and Advanced Measurement had the highest percentages as the respondents difficult courses with lower grades in comparison to all other courses while Samuel *et al* (2016) pointed out factors affecting performance of undergraduate students in construction related disciplines as concentration, lack of reading habit and reading plan and class size. Similarly, Shittu (2016) observed a strong relationship between academic performance and factors affecting academic performance, when performance of undergraduate students in Construction Measurement was analyzed. However none of these researches focused solely on the performance trend of students in core Quantity Surveying courses alongside the probable factors affecting their performance in these courses. This research then narrows it down to the Tertiary Institutions offering Quantity Surveying in Niger State.

Research Questions;

1. What are the trends in performance of core Quantity Surveying courses in selected Tertiary Institution in Niger State over the period of six years (2010- 2016).
2. What are the factors affecting Quantity Surveying students in learning core Quantity Surveying courses.

The aim of this research is to assess the performance trend of Quantity Surveying students in core Quantity Surveying courses**.** The objectives of the research are;

1. Assess the performance trend of quantity surveying students in core Quantity Surveying courses in Niger State Tertiary Institutions offering Quantity Surveying, over a period of six years (2010- 2016).
2. To assess the factors affecting performance of Quantity Surveying students in the core Quantity Surveying courses.

MATERIALS AND METHODS

For the purpose of this study both the primary and secondary data were collected. The primary data was obtained by the use of questionnaire, the use of literature review through record inspection in the department and academic office in each institution, therefore data obtained from the sources formed the basis of this study. A questionnaire was administered to find out the difficulty of core courses. The effectiveness of the teaching methods used for these courses and to assess the challenges encountered in teaching and learning of core Quantity Surveying courses were also analyzed. The performance of students was presented in tabular form, with information such as institution, year, course, grade, success and failure rate. Charts and graphs will be used to show the performance trend.

The group under study are the students of the department, all their responses were analyzed to accomplish the stated objectives. The population of final year students (500Level, ND II and HND II) in Quantity Survey Department at the institution as at 2016 was considered from Federal University of Technology Minna, Federal Polytechnic Bida and Niger State Polytechnic, Zungeru, a total of 299 students from all the institutions combined, using Krejcie & Morgan (1970) table, the sample size for this study is 169 student.The questionnaires distributed had a 93.4% response rate as 158 questionnaires were returned.Also, the grades of Quantity Surveying students in measurement courses and other core courses in the department over a period of six years were also collected. The data was gathered from each Quantity Surveying department of the various schools under study. The collected data was sorted into suitable forms for proper analysis using percentage and mean. Both descriptive and inferential statistical methods were used for the analysis of data. The descriptive statistical method employed the use of mean item score in order to rank the factors affecting the learning of selected core Quantity Surveying courses.

RESULTS AND DISCUSSION

A total of 158 respondents from the department returned duly filled questionnaire.

Students Who Applied For Quantity Surveying

Table 3.1 shows the respondents' response to whether or not Quantity Surveying was their first choice 73 said yes representing 43.20 % and 96 said no representing 56.80 %. This implies that a majority of Quantity Surveying students settled for the course as most preferred was unavailable and this can be tied to the factors that eventually affect the students' performance.

Table 3.1 Quantity Surveying as First Choice of Study

Choice	Frequency	Percentage
Yes	73	43.20 %
No	96	56.80 %
Total	169	100 %

Source: Researchers' Analysis (2017).

Performance trend of Quantity surveying students in core Quantity Surveying courses in selected institutions in Niger State.

Fig 3.1 to 3.4 shows the students average grades between 2010/2011 – 2015/2016 session in FUT Minna, Niger State Poly, Bida Poly respectively. The average grades were analyzed using descriptive analysis method.

The trends in performance of core Quantity Surveying courses in selected Tertiary Institution in Niger State over the period of six years (2010- 2016) therefore the students grades from all these institutions were analyzed, between 2010- 2016 Fig 3.1 shows the average grades in Advanced Measurement, Civil Engineering Measurement, Professional practice, Heavy Engineering and Cost Control. Civil Engineering, Professional Practice and Ethics and Heavy Engineering have the lowest numbers between grade A- C, while Civil Engineering and Heavy Engineering had the highest recorded number between grades D- F.

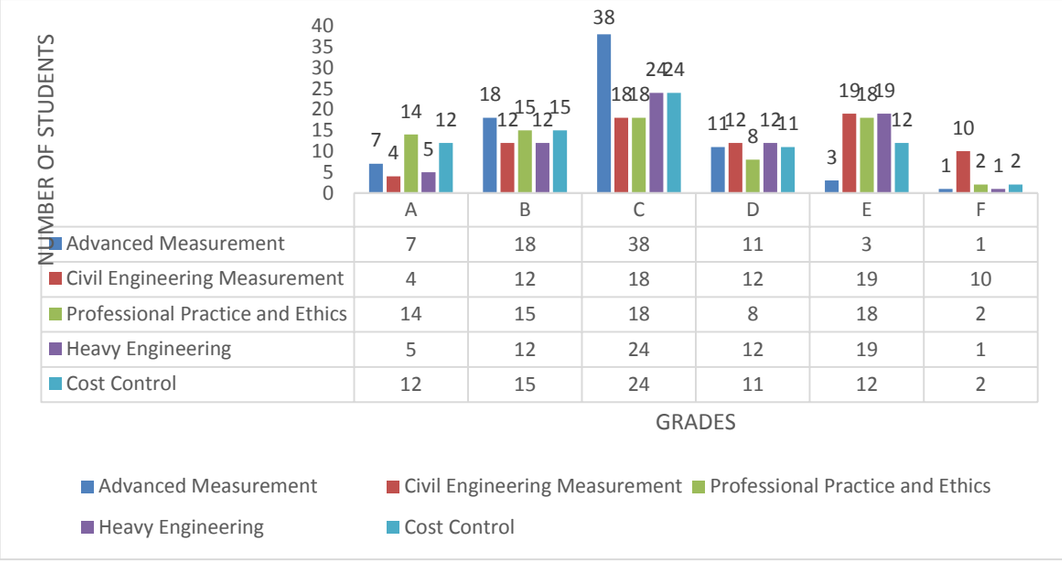
Fig 3. 2 shows average grades of ND II students from 2010 to 2016 Niger State Polytechnic, Zungeru and Building Measurement and Specifications, Tendering and Estimating, Building Construction and Principle of Engineering Measurement were the selected core courses. Principle of Engineering Measurement and Building Measurement and Specifications

recurrently had the lowest record of grades between AA and CD and the highest record of grades D and F.

Fig 3. 3 assesses records of ND II students Federal Polytechnic Bida in Building Measurement & Specification, Tendering& Estimating, Building Construction III and Principles of Engineering Measurement. This revealed that Principles of Engineering Measurement and Building Construction III had the least record of grades between A- CD and the highest record of grades in D and F.

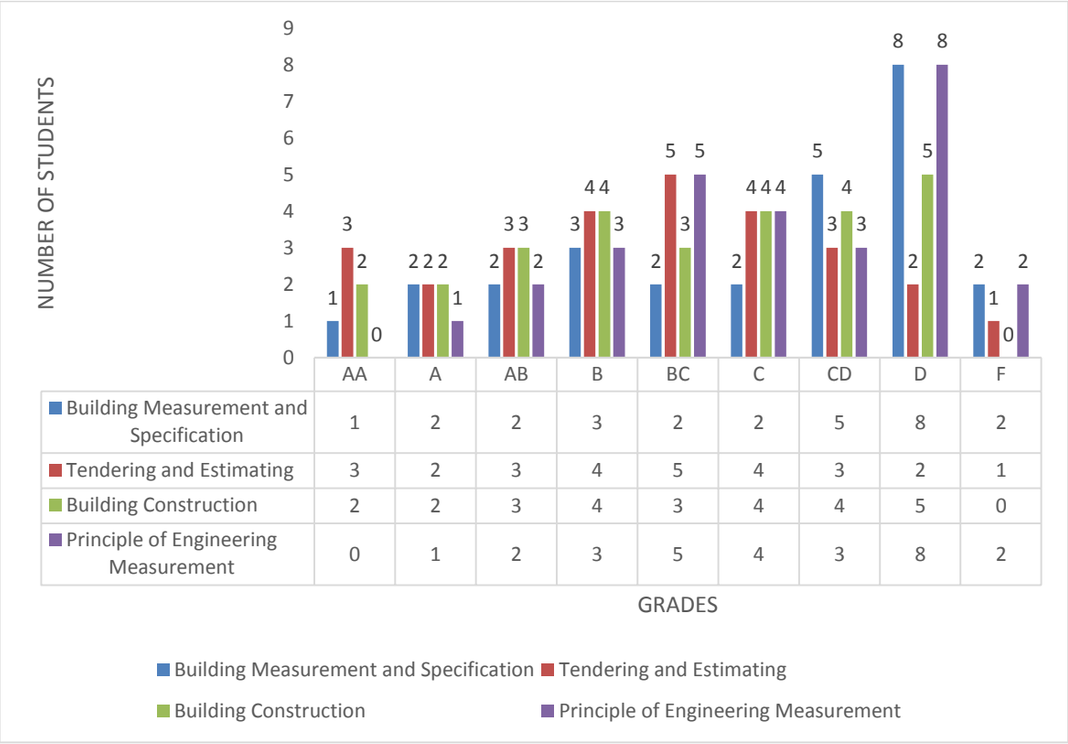
Fig 3.4 displays the HND II students of Bida Poly average grades and it was observed from the results that when Advanced Measurement of Construction Works, Construction Technology, Tendering & Estimating, Professional Practice & Procedure, Measurement of Civil Engineering Works and Measurement of Heavy Engineering Works were selected, Advanced Measurement of Construction Works, Measurement of Civil Engineering Works and Professional Practice & Procedure had the lowest record of grades between A- BC, they also had the highest record of the grade C. This same courses recorded the highest grades between D and F which means they are the courses with the least recorded performance.

This study also agrees to Shittu (2016) whose results showed that for these selected institutions, Measurement courses have the highest record of average grade the which is BC and C.



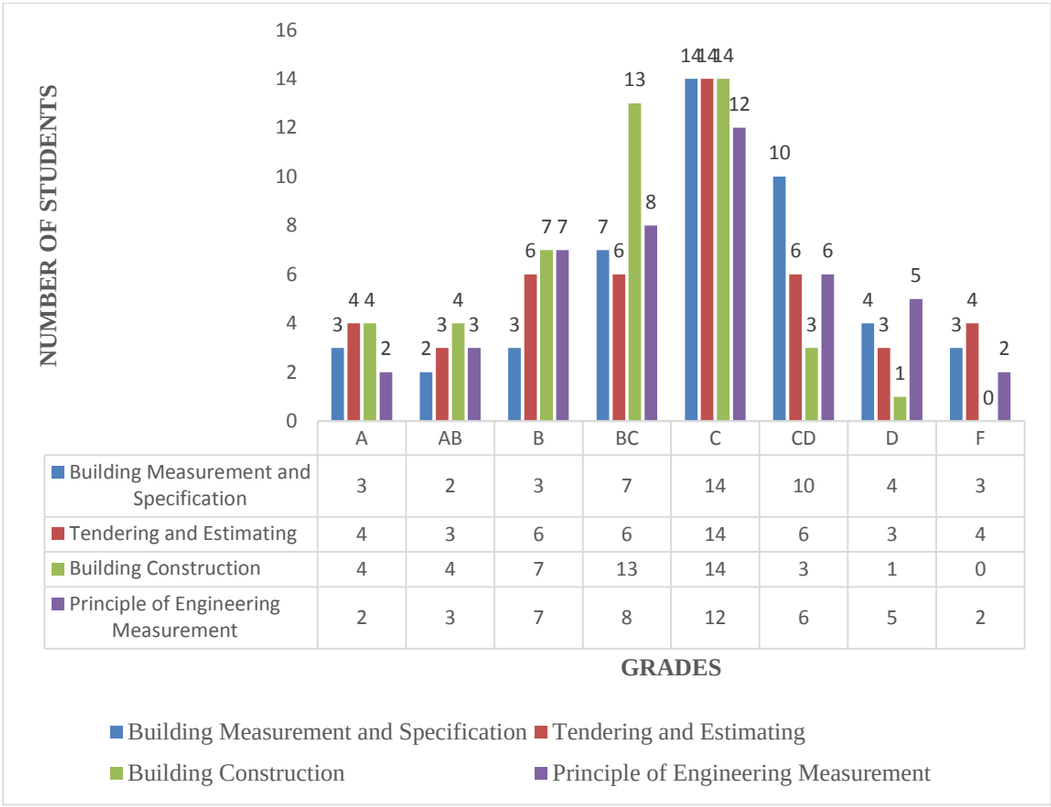
	A	B	C	D	E	F
Advanced Measurement	7	18	38	11	3	1
Civil Engineering Measurement	4	12	18	12	19	10
Professional Practice and Ethics	14	15	18	8	18	2
Heavy Engineering	5	12	24	12	19	1
Cost Control	12	15	24	11	12	2

Fig. 3.1: FUT Minna 500 Level Students Average Grades Between 2010/2011 – 2015/2016 Sesssion



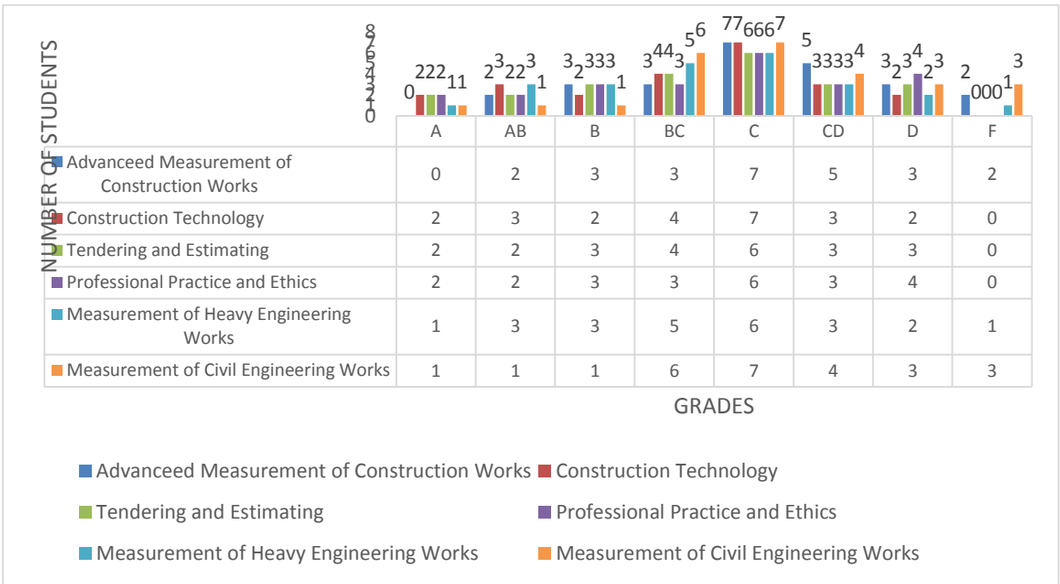
	AA	A	AB	B	BC	C	CD	D	F
Building Measurement and Specification	1	2	2	3	2	2	5	8	2
Tendering and Estimating	3	2	3	4	5	4	3	2	1
Building Construction	2	2	3	4	3	4	4	5	0
Principle of Engineering Measurement	0	1	2	3	5	4	3	8	2

Fig. 3.2: Niger State Polytechnic, Zungeru ND II Students Average Grades 2010/2011 – 2015/2016



	A	AB	B	BC	C	CD	D	F
Building Measurement and Specification	3	2	3	7	14	10	4	3
Tendering and Estimating	4	3	6	6	14	6	3	4
Building Construction	4	4	7	13	14	3	1	0
Principle of Engineering Measurement	2	3	7	8	12	6	5	2

Fig. 3.3: Federal Polytechnic, Bida ND II Students Average Grades 2010/2011- 2015/2016



	A	AB	B	BC	C	CD	D	F
Advanceed Measurement of Construction Works	0	2	3	3	7	5	3	2
Construction Technology	2	3	2	4	7	3	2	0
Tendering and Estimating	2	2	3	4	6	3	3	0
Professional Practice and Ethics	2	2	3	3	6	3	4	0
Measurement of Heavy Engineering Works	1	3	3	5	6	3	2	1
Measurement of Civil Engineering Works	1	1	1	6	7	4	3	3

Fig. 3.4: Federal Polytechnic, Bida HND II Students Average Grades 2010/2011- 2015/2016

Factors Affecting Students Performance in Core Quantity Surveying Courses

Table 3.2 shows the results of mean ranking when respondent's responses were analyzed. Factors affecting students' performance in Core Quantity Surveying Courses. Poor understanding of Construction Technology ranked 1st with 3.7515 as mean score which shows that there is obviously no way that measurement courses will not be affected since Construction Technology is a relevant knowledge and this finding agrees with Shittu (2016) who deduced poor knowledge of Construction technology as a factor responsible for failure, lack of interest had 2nd position with 3.6923 this can be traced back to majority of students studying did not chose Quantity Surveying as their first choice, Inadequate learning materials was the 3rd highest with 3.5621 as its mean score teaching and training method

3.500, complexity of taking off process was ranked 4th with a mean score of 3.4556, lack of provision of a bridge between theory and practical had a 3.4497 mean score.

Furthermore this research thereby agrees with Samuel *et al*, (2016) findings on factors affecting performance of undergraduate students in construction related discipline in Nigeria as it revealed that concentration, lack of reading habit and reading plan and class size affects the performance of undergraduates construction related discipline were key factors that affected students' performance in construction related discipline.

Other factors were; lack of initiative and use of imagination, class size, use of outdated resource materials, inadequate or poor exam preparation, lack of concentration, heavy course workload, inadequacy of technical staff to teach the practical aspect of measurement courses, difficulty of examination questions sufficiency of lecturers to teach measurement courses insufficient time during examination stress inadequate effort to learn with mean scores of 3.3988, 3.3988, 3.3195, 3.2899, 3.2803, 3.1190, 2.8364, 2.7738, 2.8272, 2.7560, 2.7126, 2.7083, 2.5818 and 2.5210 respectively.

Pascarella & Terenzini (2005) found that most educators believe that effort is positively related to performance, previous empirical studies of the link between effort and student performance find mixed, and often contradictory, evidence on whether extra effort improves or harms performance and this study disagrees with the findings as inadequate or poor exam preparation ranked 10th among these factors and had a 3.2803 mean score. Shittu (2016) concluded that poor constructional knowledge by most student is the main factor affecting students' academic performance in construction measurement and this corresponds with the results of my findings, this factor had a mean score of 3.7515 and was ranked 1st under factors affecting students' performance in core quantity surveying courses. Constructional knowledge is valuable to the understanding of the Quantity surveying core courses hence the recorded difficulty in understanding it shows that the performance will definitely be affected. Poor Teacher Student Relationship has a mean score of 3.20 in this research and was ranked 7th.

Hence it agrees with Shittu (2016) factor lack courage to approach lecturers for advice for fear of rebuke in 100 to 300 level students, since this research focused on final year students only its agrees as even at final year it can be seen that student- lecturer relationship is still not established fully, the factors can relate as responses showed poor teacher student relationship.

Table 3.2 Factors Affecting Students Performance in Core Quantity Surveying Courses

S/No.	Items	Risk Categories 5 4 3 2 1	Total	Mean Score	S.E	S.D	Rank
1	Poor Understanding Of Construction Technology	69 44 9 29 18	158	3.7515	.08992	1.16895	1
2	Lack Of Interest	23 65 38 31 12	158	3.6923	.10943	1.42261	2
3	Inadequate Learning Materials	17 38 30 52 36	158	3.5621	.09781	1.27148	3
4	Teaching And Training Method	14 36 51 22 55	158	3.5000	.09376	1.20072	4
5	Complexity Of Taking Off Process	7 22 64 40 36	158	3.4556	.10209	1.32718	5
6	Lack Of Provision Of A Bridge Between Theory And Practical	24 93 1 29 22	158	3.4497	.09998	1.29978	6
7	Lack Of Initiative And Use Of Imagination	14 27 58 48 23	158	3.3988	.09959	1.29087	7
8	Class Size	5 14 70 55 25	158	3.3988	.09407	1.21931	8
9	Use Of Outdated Resource Materials	27 65 32 25 20	158	3.3195	.09583	1.24582	9
10	Inadequate Or Poor Exam Preparation	20 81 12 37 19	158	3.2899	.09510	1.23634	10
11	Lack Of Concentration	40 94 0 23 12	158	3.2803	.09252	1.15932	11
12	Heavy Course Workload	36 77 3 34 19	158	3.1190	.08888	1.15198	12
13	Inadequacy Of Technical Staff To Teach The Practical Aspect Of Measurement Courses	37 83 3 30 16	158	2.9763	.11038	1.43491	13
14	Difficulty Of Examination Questions	15 52 8 67 27	158	2.8364	.09231	1.18574	14
15	Sufficiency Of Lecturers To Teach Measurement Courses	32 47 3 59 28	158	2.7738	.09944	1.28884	15
16	Insufficient Time During Examination	30 83 11 34 11	158	2.8272	.09125	1.16139	16

17	Stress	34	78	4	36	17	158	2.7560	.08631	1.11869	17
18	Inadequate Effort To Learn	11	47	27	66	18	158	2.7126	.10054	1.29922	18
19	Lack Of Reading Habit And Reading Plan	13	48	23	67	18	158	2.7083	.10038	1.30110	19
20	Lack Of Self-Discipline	15	63	28	50	13	158	2.5818	.08427	1.08241	20
21	Laziness	25	84	7	40	13	158	2.5210	.07348	.94956	21

Source: Researchers' Analysis (2017)

Legend

1 = "Strongly Disagree", 2 = "Disagree", 3 = "Neutral", 4 ="Agree" And 5 = "Strongly Agree"

CONCLUSION AND RECOMMENDATION

This research concludes that Advanced Measurement, Civil Engineering Measurement and Heavy Engineering Measurement had the lowest academic performances of students when compared to other core Quantity Surveying courses in all the tertiary institutions in Niger State.

Poor understanding of Construction Technology is the main factor affecting students' academic performance as perceived from the analysis. This item had the highest respondents mean response of 3.7515. Lack of interest is another factor that greatly affects students' academic performance and it attracted the second highest mean response of 3.6923 respectively.

It is recommended based on the research carried out that in order to improve the performance in Measurement courses, more practical teaching methods should be adopted i.e. technical staff should often take the student to site to increase their constructional knowledge. It is also advised that students should always visit the site for their self-increment in constructional knowledge. Based on the number of lecturers available at all the three institutions there is need for more technical staff to take the practical aspect of courses that are construction related. Students who applied Quantity Surveying should be given preference to curb the issue of lack of interest.

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FACTORS INFLUENCING REWORK OCCURRENCE IN SOME SELECTED ONGOING BUILDING PROJECT, ABUJA

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Rework is the act of carrying out a work for the second time due to defect. It remains a chronic problem in the construction industry because of human imperfection. It is a menace in the Nigerian construction industry as it contributes to cost and overruns in project. It leads to clients' and contractors' dissatisfaction. The aim of this research is to study factors causing rework occurrence in ongoing building project and elements that can be influenced by it. It is a criteria-based research. The targeted population constituted 25 ongoing building projects, precisely commercial buildings. Data collection was carried out with the use of structured questionnaire and checklist for archival data. Data presentation was done using frequency table and bar charts while data were analyzed using relative importance index and T-test. The result of the analysis showed that the level of occurrence of rework in building elements varies. It was discovered that the main factors causing rework are poor workmanship, defective materials and incompetent supervision and elements mostly affected are Blockwork, Roof and plastering. Conclusively, the level of rework is one of the key determinants to project performance. Construction team all have crucial roles to play to the success of any project. Construction organizations should re-examine the way they conduct their operations, become technically oriented and become prevention-focused to help strive for better organizational management.

Keywords: Construction, Cost Overrun, Ongoing Project, Rework.

INTRODUCTION

Construction is one of the largest and most dependable industries that has contributed immersely to our economy and about 10% of the Gross National Product (GNP) according to (Navon, 2005). The construction industry has been in existence since ancient times as nature itself because it involves a general project that affects all people. Many construction projects report poor performance due to evidences in specific causes as changes in designs, lack of project leadership skills leading to rework (UNRWA, 2006). It is complex in nature as it is made up of different sections, for instance, the clients, contractors, consultants, etc. (Dlakwa and Culpin, 2010) reports that the Nigerian Construction Investment is over 60% of the Gross fixed capital formation (GFCF). Building industry is a subset of the most important sectors in the Nigerian economy, (Adedeji, 2008) and one of the threats to the building industry is "Rework".

It is defined as the act of correcting, rebuilding or redoing defects that has been done in the initial. It is also the unnecessary effort of redoing a process or activity that is incorrectly implemented the first time (Oyewobi, 2011). According to Navigant Construction Forum (2012), American society of civil Engineers and Love (2010), reworks has a considerable impact on the industry as a whole because it leads to lower productivity, less trust and profit, increased workforce.

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It is prolific in the construction industry. It is even a popular terminology in construction industry. A project, irrespective of completion time or cost fitting is indeed a failed one if it is not a quality one and cannot perform its function, it is called a white elephant project. In a study Baker, Fisher and Murphy, (2010) to gauge the value of customer satisfaction as a measure of project success, analysis of responses from project managers caused the researchers to conclude that that project success means much more than merely meeting cost schedules and performance specifications. This research states the problem of the factors causing reworks in selected ongoing building project and the elements that can be influenced by it to help improve quality project, cost and time overrun. The aim of this research is to examine the factors influencing reworks of selected ongoing building projects while its objectives are, (1) To identify factors causing reworks in selected ongoing building project. (2) To determine rework's level of occurrence in selected superstructure elements. (3) To determine the difference between final cost of rework and initial cost of rework in superstructure elements. This research examines factors influencing reworks of selected ongoing building projects as different researchers have proven that rework is the major cause of cost and schedule overrun (Oyewobi *et al.*, 2010) and (Wasfy, 2010) said that it leads to client's dissatisfaction which threatens the construction industry.

Rework in Construction Project

The construction industry has the iniquitous reputation of being fragmented, lacking coordination and communication between parties, creating adversarial contractual relationships and lacking customer focus (Love, Edwards and Smith 2005). Besides, there is generally an absence of systems within projects to monitor and control rework (Hwang, Thomas, Haas and Caldas, 2009). This combination of problems has meant that rework has become an insidious problem and consequently, the costs of rework have been found to be considerable (Love et al, 2005). Love, Holt, Shen, Li, and Irani (2002) stated that both the internal and external environments of construction projects are dynamic and relatively unstable. Tasks performed in construction projects are typically divided between professional disciples (architect, structural engineer, project manager) and trade disciplines (the contractors' and sub-contractors' carpenters, bricklayers, plumbers), which frequently operate independently of one another. Oyewobi and Ogunsemi (2010) reported that the genesis of the problems experienced by the construction industry and clients lie in the division of the responsibilities between the design and the construction aspect. A direct criticism of the organizational structure of the construction industry by many researchers is that the construction industry is different in the sense that the design process is separated from construction process. Adejimi (2005) argued that construction is not well-connected or integrated until at the terminal end of each other rather than overlapping and mutually benefiting throughout the process. Adejimi (2005) further opined that if the design process is to be enhanced, the participants within the industry, including the architects, planners, engineers, contractors and the initiator of the process, need to come together in well-coordinated effort, especially if rework-free construction is to be attained. The occurrence of rework can be attributed to changes during the design and construction stage. Love (2002) affirmed that a degree of change can be, and to a certain extent should be expected in construction, as it is difficult for clients to visualize the end product that they procure. Othman, Jaafar, Harun, and Ibrahim (2016) identified that building defects can be categorized into two which are patent and latent defects. Patent defects are visual defects while latent defects are not but becomes apparent at a later date. Constructability is a problem in Nigerian construction industry according to Ibrahim *et al.* (2012) so it should be more frequent than ever because it is a strategy used to attain maximum skills of construction knowledge throughout the construction process and balance various project constraints to achieve building performance.

Rework Occurrence and Superstructure Elements

Ransom (2017) stresses that defect in buildings occur not only due to lack of knowledge but also by non-application and misapplication of knowledge. Despite the considerable amount of research that has been undertaken, there is limited evidence that rework has been reduced to improve project performance (Aiyetan 2013; Hwang *et al.* 2014; Kakitahi *et al.* 2014; Taggart *et al.* 2014; Jingmond and Ågren 2015). According to Dahanayake and Ramachandra (2015), building elements that can be affected by rework and their percentage of occurrence are as follows; Block work in superstructure, Door 5%, Window 5%, Column

27%, Beam 27%, Lintel, Slab 27%, Roof 11%, Plastering 10%. According to Aiyetan (2014); Frame and Upper floor, Stair, Slope, Floor opening, Balustrade, Handrail. Factors influencing rework occurrence are as follows; wrong laying of forming course (block work), poor quality of concrete, poor plastering, deflection of part of slab, lack of attention to quality, lack of support to site management, ineffective coordination and integration of components, use of poor materials, use of poor materials, omissions during construction, quality failure, lack of proper monitoring and evaluation, errors during construction, overlooked site condition, poor site practices Aiyetan (2014). In addition, poor communication and improper use of technology leads to rework, lack of experience and knowledge of design and construction process and lack of client involvement in the project according to Love *et al.* (2012a) and Ye *et al.* (2014). Subcontractor selection is also vital as was proposed by Tiamiyu (2012) because it can improve or reduce the overall performance of the project. Mastenbroek (2010) suggested that work preparation before design and construction stage is essential.

METHODOLOGY

The criteria set for this research are as follows; it must be a commercial building, it must be an ongoing project, it must be located in Abuja, it must not be an abandoned project, it must be 75% complete. This percentage completeness of a building is determined by the number of items completed, also Actual Time Elapsed/ (Actual Time Elapsed + Remaining Duration) and during the course of data collection, 25 construction companies met the research criteria that was why the sample size was selected. As such, 25 Questionnaires and checklists were administered based on the targeted population for this research which is 25 commercial ongoing building projects supervised by 25 different construction companies within Abuja metropolis. The questionnaire is the primary source of data collection which identified factors causing rework and the superstructure elements ranked by the respondents based on a 5 point likert- scale using Relative Importance Index (RII).

RESULT AND DISCUSSION

The questionnaire and check-list respondent profession consists of Quantity Surveyor, Architect, Civil Engineer, Builder and a total of twenty-five questionnaires and check-list were returned showing an effective response rate of 100%.

Figure 1, Quantity Surveyors emerged the largest contributor to this research with percentage of 48%, followed by the Architects with percentage of 28%, next is the Civil engineers with percentage of 16% and lastly the Builders with percentage of 2% which is the lowest.

Figure 2 shows the academic qualifications of respondents, respondents with BSc. / B. Tech made the largest quota of responses to this research with 63%, followed by M.Sc. / M. Tech with 20%, Diploma with 15% and PhD with 2% respectively.

Figure 3 shows the years of respondent's experience in the Nigerian construction industry, where less than 5 years, 5 – 10 years, 11 – 15 years and 16 – 20 years have 15%, 55%, 20%, 10% percentage contribution respectively. This shows that the respondents are experienced and can provide useful information for this research.

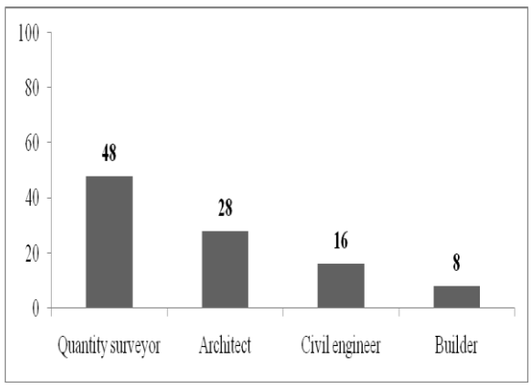

Fig. 1: Profession of Respondents

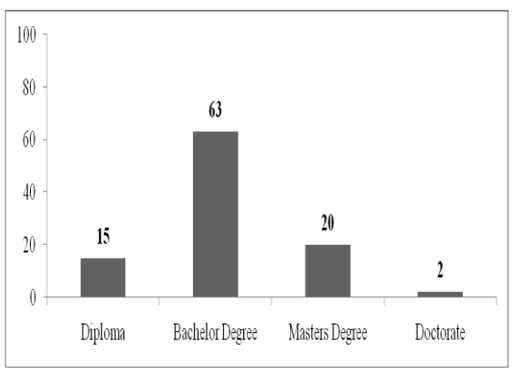

Fig. 2: Academic Qualifications of Respondents

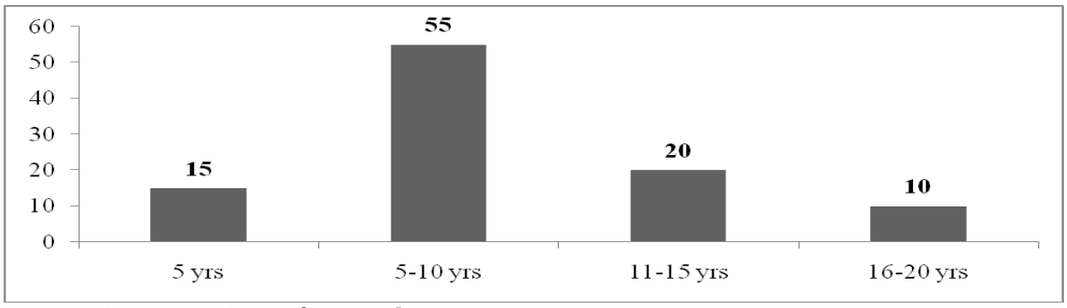

Fig. 3: Experience of Respondents

Table 1: Factors Causing Rework.

Factors	1	2	3	4	5	RII	Rank
Poor workmanship	0	2	2	5	16	0.88	1st
Defective materials	1	1	2	7	14	0.86	2nd
Incompetent supervision	2	3	0	5	15	0.82	3rd
Insufficient supervision	1	2	5	5	12	0.80	4th
Lack of coordination	1	5	0	9	10	0.78	5th
Errors and omission in drawings	0	3	8	5	9	0.76	6th
Deviation from drawing	5	0	4	5	11	0.74	7th
Improper subcontractor selection	4	5	1	4	11	0.70	8th
Improper work sequencing	5	4	5	5	6	0.62	9th
Wrong materials	5	8	9	0	3	0.50	10th

Source: Researcher's Analysis (2017)

Table 2: Level of Occurrence of Rework

uperstructure Elements	1	2	3	4	5	RII	Rank
Blockwork	0	1	11	12	1	0.70	1st
Roofs	0	4	9	10	2	0.68	2nd
Plastering	0	2	16	6	1	0.65	3rd
Beam	0	5	17	3	0	0.58	4th
Column	0	6	16	3	0	0.58	4th
Lintel	0	6	17	2	0	0.57	5th
Slab	0	9	13	3	0	0.55	6th
Frame & floors	0	17	6	2	0	0.48	7th
Door	1	19	4	1	0	0.44	8th
Window	1	19	4	1	0	0.44	8th

Source: Researcher's Analysis (2017)

Table 1 shows the ranking of the factors causing reworks in ongoing building projects using relative importance index, the greater the index score the higher the rank. Therefore, the main causes of reworks are; "Poor workmanship" ranked 1st with RII of 0.88, followed by "Defective materials" and "Incompetent supervision" with RII of 0.86 and 0.82 respectively. "Insufficient supervision" ranked 4th with RII of 0.80%, "Lack of coordination" ranked 5th with RII of 0.78%, "Errors and omission in drawings" ranked 6th with RII of 0.76%, "Deviation from drawing", "Improper subcontractor selection", "Improper work sequencing", "Wrong materials" with RII of, 0.74, 0.70, 0.62 and 0.50 respectively.

Table 2 shows the ranking of the level of occurrence of rework in superstructure elements using relative importance index. The effect of rework in the superstructure elements are; "Blockwork" was ranked 1st with RII of 0.70, "Roof" was ranked 2nd with RII of 0.68. "Plastering" was ranked 3rd with RII of 0.65 while Beam, Column, Lintel, Slab, Frame & floors, Door and Window with RII of 0.58, 0.58, 0.57, 0.55, 0.48, 0.44 and 0.44 respectively.

The first objective of this study was to identify the factors causing reworks in selected ongoing building project. Comparing this research with that of Tiamiyu (2012), Poor workmanship was ranked first which disagrees with his. Defective materials were ranked second in this research whereas his is poor workmanship. One of the reasons why many construction projects experience rework is as a result of poor workmanship offered by the contractors and subcontractors because leads to cost overrun in construction projects.

The second objective of this study was to determine the level of occurrence of rework in selected superstructure elements. Rework occur most in Blockwork, Roofs and Plastering based on the analysis result whereas in Tiamiyu (2012), Blockwork, roofing and finishes were ranked 1st, 7th and 8th. On average, the research concurs with Tiamiyu (2012).

The third objective of this study was to determine the difference between cost of rework and initial cost of superstructure elements. From the result of the analysis carried out, rework often lead to cost overrun in building project which means there is significant difference between initial contract sum and final contract sum. If the client is not able to meet the financial commitment this may result to project abandonment.

Table 3: T -Test Analysis For Significance Test

S/N	Variables	Year Span				N	95% CI for Mean Difference	R	T	Df	Remark
		Initial		Rework							
		M	SD	M	SD						
1	Cost	6346266.67	4650067.95	586266.67	623231.61	15	3444747.94, 8075252.06	0.78*	5.34*	14	SS

Source: Researcher's Analysis (2017)

CONCLUSION AND RECOMMENDATION

This research work revealed the factors causing rework and elements that can be influenced by it. The factors causing reworks are; Poor workmanship, Defective materials, Incompetent supervision, Insufficient supervision, Lack of coordination, Errors and omission in drawings, Deviation from drawing, Improper subcontractor selection, Improper work sequencing and Wrong materials. The elements that can be influenced by it are; Blockwork, Roofs, Plastering, Beam, Column, Lintel, Slab, Frame & floors, Door and Window. Therefore, it can be concluded that the factors considered in this study has a profound impact on the selected building elements considered in this study. New method of construction need to be adopted including intensive training in other to attain constructability thereby minimizing deviation of cost and time overrun and quality and hereby recommends the following;

i. Attention should be given to the management style of different construction organizations as it contributes to constructability in the construction sector, negligence during construction, should also be avoided.

ii. Constructability should be implemented by construction organizations to help renew their system of operation and reinforce them for higher levels of performance.

iii. Construction organizations should re-examine the way they conduct their operations, become technically oriented and prevention-focused to strive for better organizational management.

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ANALYSIS OF COSTS OF REWORK ON TIME AND COST PERFORMANCE OF BUILDING CONSTRUCTION PROJECTS IN NIGERIA

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Rework produces undesired and unnecessary results which degrades cost and time performance of construction projects. This study therefore, analysed the impact of cost of rework on time and cost performance of building construction projects in Abuja, using selected completed public building projects. A pro forma was adopted for gathering data on rework cost, cost and time of selected building projects, while structured questionnaire was used to collect information on the likely measures for reducing rework incidences from construction professionals that were involved in the delivery of the identified projects. Regression analysis, correlation analysis, relative importance index and Kruskal-Walis test were employed for data analysis. The study revealed a significant relationship between the cost of rework and initial and final project cost of delivering the buildings, as an average of 3.53% impact on the initial project cost, 46.60% contribution to cost overrun, and p-value of 0.000 was observed in all the assessed projects. For the project delivery time, a significant relationship between cost of rework and rework time, as an average of 3.46% impact on the initial delivery time, extra 19 days and p-value of 0.000 was observed on all assessed projects. Team building and education, management commitment, employee involvement were identified to be the most effective measures to minimising rework. Based on these result, the study concluded that rework contribute significantly to cost ad time overruns experienced in building construction projects. It was recommended that the elimination of rework triggers through a good foresight and alertness by project participants prior to commencement of work will help improve cost and time performance of construction projects.

Keywords: *Construction project, Cost overrun, Rework, Time overrun, Nigeria*

INTRODUCTION

The construction industry is the driving force behind socio-economic development of any nation; and the industry takes huge amount of money, time and energy (Saidu and Shakantu, 2016a; Meshksar, 2012). It is among the major industries that contribute to economic growth and civilization; as such its importance is approved in all communities (Meshksar, 2012). The activities of the industry improves the quality of life by providing infrastructures such as buildings, roads, hospital, schools among other facilities (Saidu and Shakantu, 2016b; Saidu and Shakantu, 2016c). In spite of the significance of the construction industry, it is always been faced with such problems as poor financial performance, high cost of project delivery, poor quality and material waste and failure to deliver value to clients on schedule (Saidu and Shakantu, 2016c; Abdul-Rahman *et al.,* 2013). Consequently, inefficient productivity and poor performance experienced in the construction industry has led to its wide criticisms as argued by Simpeh (2012). The cost and schedule overruns often experienced in the construction projects delivery is directly and significantly attributable to rework factors (Hwang *et al.,* 2009). Therefore, rework is one of the major factors responsible for the setback experienced in the industry as observed by (Simpeh, 2012). Love and Edwards (2004a) affirmed that rework contributes mainly to time lost and time overrun and these ultimately affect the costs, quality, resources and other project characteristics

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Rework according to Love (2002) and Palaneeswaran (2006) is defined as the avoidable efforts expensed in re-doing activities that were incorrectly implemented at the initial time. Rework and waste have already been acknowledged as non-profitable occurrences that critically influence construction projects' productivity and performance (Josephson *et al.*, 2002; Alwi *et al.*, 2002). According to Cooper (1993), rework emerges as overtime, additional resources in the form of labour, plant, workers, and reductions in project scope and quality and schedule slippage. Love (2002) opined that rework would naturally increase total project costs by 12.6%. Similarly, Davis *et al* (1989) reported that rework can cause additional cost to construction of up to 12.4% of the total project cost.

Building construction projects in Nigeria are prone to running out the proposed budget cost, which implies that even the initial planned duration will not be met (Okpala and Aniekwu, 1988). Oyewobi *et al*. (2011) described cost and time overruns as a cankerworm that have damaged the fabrics of the construction industry in Nigeria; also, that poor quality of end products of the construction industry in Nigeria has denied clients value for their monies. Summarily, the adverse effect of rework include reduction in profit, higher costs, loss/reduction of market share, lower productivity, broken reputation, higher turnover of workforce and management, and ultimately high cost of litigation among project participants over responsibility for overruns and delays.

Oke and Ugoje (2013) assessed rework cost of selected building projects in Ondo state, Nigeria; and found that a significant relationship existed between rework costs and each of initial and final cost, cost overrun, and initial, final time and time overrun. Simpeh *et al.*(2012) evaluated the direct and indirect costs of rework in the South African construction industry and found that total rework cost was 5.12% of the original contract value, and that rework contributed significantly to project cost overruns.

Mahamid (2016) analysed the cost and causes of rework in residential building projects in West Bank, Palestine. The study revealed that cost of rework in building projects ranges between 10%-15% of the original value. Oyewobi *et al.* (2011) evaluated the relationship between rework cost and variation and time overruns of 25 selected institutional building projects in Niger state. The study found rework cost in different elements of the buildings studied.

Ajayi and Oyeyipo (2015) studied the effect of rework on project performance in building project in Lagos State, Nigeria. The study revealed a significant relationship between cost of rework and original contract sum, original and final contract period, with exclusion of final contract sum. Abeku *et al.* (2016) carried out a study on Projects Management and the effect of Rework on Construction Works. The study found out that the combined effect of rework on the projects' time and cost were 54.75 and 28.20% respectively.

However, little has been done on rework in the geographical area of the study; and rework according to Simpeh (2012) has remained a natural problem in construction. Hence, there is the need to analyze the cost of rework on building project performance. The aim of this study is to analyse the impact of cost of rework on time and cost performance of building construction projects, with a view to ascertaining the measures for reducing rework occurrence on construction projects. The specific objectives of the study are: to determine the relationship between cost of rework and project cost (initial and final cost), to determine the relationship between cost of rework and rework time, and to examine the most effective measures for minimizing rework on building projects. This study will contribute and improve understanding of construction rework; awareness of the possible problems resulting from rework will be increased; it will also add to the body of knowledge on rework in construction projects. The outcome of this study will have the overall effects of reducing cost and time overruns attributable to rework, which will enhance project performance, and reduce or minimize possible conflicts, which may arise because of rework.

To guide this study, the following hypothesis were made:

H_{01}- There is no significant relationship between the cost of rework and project cost
H_{02}- There is no statistically significant correlation between the costs of reworks and rework time
H_{03}- There is no agreement among the respondents on the measures of minimising rework

Impact of Rework on Construction Projects

According to Palaneeswaran (2006), rework has both direct and indirect effects on the performance of construction projects. For a poorly managed projects, the overall impacts of rework may be equal to or even exceed the estimated profit margin (or markup). Also, there are cases in which the ripple effects of rework will be carried forward on different aspects such as reputation, stress, motivation and relationships. Palaneeswaran (2006) revealed that additional time to re-do task, additional costs for re-doing work, additional materials for rework and subsequent wastage handling, and additional labour for rework and related extensions of supervising manpower; were the direct effect of the impact of rework on project management transactions. Rework can negatively affect the performance and productivity of design and construction organizations (Chan and Kumaraswamy, 1997; Love, 2002). In addition, it is the main factor that contributes to time and cost overruns on construction projects.

The traditional system in which designs have to be complete before work can start on site, have made projects not to meet clients' needs owing to the associated cost and time overruns experienced (Oyewobi *et al*., 2011). According to Hwang *et al.* (2009), construction projects frequently experience cost and schedule overruns and rework have been established to be a significant factor that directly contributes to these overruns. Cost overrun is a very regular incident and is associated with almost every type of projects within the construction industry (Azhar *et al.*, 2008). Cost has been seen as the major factor for measuring project success. The major factors affecting project costs are qualitative: such factors are client priority on construction time, procurement methods, contractor's planning capability and market conditions including the activity level of construction (Elchaig *et al*., 2005). Regrettably, a lot of construction projects incur cost overruns as a result of rework. Consultants work very hard to avoid it, because of its resultant high effect on project cost increases (Love, 2002). A situation in which the final cost of the project exceeds the original (initial) estimates is known as cost overrun (Avots, 1983). Cost overruns are main problems in project development; and they are regular feature in the construction industry especially for developing countries of the world (Endut *et al.*, 2005). Cost overruns makes projects costly for the both the contractors and clients (Endut *et al.*, 2005). Odeck (2004) observed that cost overruns ranged from59 to 183% and are predominant on smaller projects than larger ones, especially Public Roads projects in the Norwegian construction industry. In United Kingdom construction industry, Jackson (2002) reported that almost one third of all clients experience cost overrun in their projects.

Similarly, Marosszeky (2006) found out that the mean of rework costs were 5.5% of the value of the contract; comprising 2.75% direct costs, 1.75% and 1% indirect costs for major contractors and subcontractors respectively. This study was based in New South Wales, Australia. Meshksar (2012) reported that the cost of rework is 1.30% - 3.30% of contract value, and an average of 2.095%; and rework time of 3.0%-8.0% with an average of 5.182%. Oyewobi *et al*. (2011) reported that on elemental basis, rework costs was as high as 5.29%; and that rework costs constitutes 3.47% of the entire projects studied. Oyewobi *et al*. (2011) observed a positive link between rework cost and project time overrun; indicating that increase in cost of remedying nonconforming work will give rise to increase project completion time.

Love *et al*. (1999) discovered that the cost associated with poor quality work (such as rework due to poor workmanship) were as high as 12% of the total project budgets and will require 11% of the total project schedule. Josephson and Hammarlund (1999) stated 2% - 6% of contract sum is the cost of rectifying and redoing works which do not conform to quality in the construction projects; projects of such include: residential, commercial and industrial building projects. In the same vein, Love and Li (2000) reported the cost of redoing and rectifying poor quality in residential building projects to be 3.15% and for industrial building projects is 2.40% of the contract sum. However, when contractors ensure effective and continuous quality improvement strategy and quality assurance systems, the cost of poor quality will be less than 1.00% of the total project cost (Love and Li, 2000). Robert (1991) reinforced this position by stating that spending extra 1.00% on prevention cost would result to 80% savings on cost of failures.

Rework have been confirmed to be continuously affecting both cost and schedule performance throughout the construction industry (Hwang *et al.*, 2009). A delayed project experiences extended or accelerated time which invite additional cost (Hamzah *et al*., 2011). Delays

(time overrun) causes increase in disturbance of work, loss of productivity, increased time-related costs late completion of project work, third party claims, and contract abandonment or termination (Hamzah *et al*., 2011). Most time overruns experienced in construction projects are due to rework (Hwang *et al*., 2009). Construction project time overrun is defined as an addition of time further than the agreed contractual time at the tender stage (Endut *et al.*, 2005). Rework can lead to a considerable addition of a project's time and cost overrun, especially, during the construction stage. The effect of delays or time overruns for the contractor included increased costs, reduced profit margin and battered reputation (Endut *et al*., 2005). The clients also incur some cost in the form of additional charges and professional fees and reduced incomes, which result from delayed occupancy. Most contractors believe that duration set by the client is realistic and prepare their bid accordingly; this is a factor responsible for construction delays (Ng *et al*., 2001). Time overruns is a regular phenomenon in construction; time overruns is a common problem in most civil engineering contracts (Alkass *et al.*, 1995; Al-Khalil and Al-Ghafly, 1999). Similarly, Elinwa and Joshua (2001) reported that time overrun is a recurring decimal in the construction industry of Nigerian.

Josephson *et al.* (2002) estimated that the cost of non-conformance amounted to 7.1% of total construction work hours. It is believed that the direct effects of re-doing and rectifying poor quality work on project management businesses according to Palaneeswaran (2006) are; additional time for remedying failures and extension of supervision time among others. Palaneeswaran (2006) reported a time overrun of 277 days, of a sample private building project in Hong-kong. According to Chan and Kumaraswamy (1997), completing projects within the budgeted time is an indication of an efficient construction industry; and the estimation of completion time of projects is dependent on the intuition, skill and experience of the planner/ planning engineer. Time overruns are costing Lebanon a great deal of money; therefore, there is an indisputable need to find more effective methods for overcoming rework problems (Mezher and Tawil, 1998).

Measure of Minimising Rework

Wasfy (2010) suggested that many issues that should be considered in orderto minimize rework occurrences in construction projects are: design scope freezing, changes, value management, use of information technology, supervisors training, quality control plan and project inspection. One of the good techniques of reducing rework identified by Love and Edwards (2004) is design scope freezing. Love and Edwards (2004) maintained that design scope freezing will reduce the probability of rework occurrences. The difference between the contractual requirements contained in the original contract between the parties and the additional requirements during the actual construction of the project is known as change (Oracle White Paper, 2009). Changes could be classified as directed (owner originated) or constructive (contractors-oriented) changes. These changes whether initiated by either the owner/contractor may cause rework; thus minimizing changes means reducing occurrence of rework.

Peter *et al*. (2010) emphasised the role of skilled work force, good communication, employee involvement and management commitment in improving quality and curtailing waste and rework in construction. It is obvious that the participation of subcontractors at both the planning and construction stage will lead to increased effective communication between subcontractors and their main contractors. This will translate into effective and proper coordination of site activities, which will eventually reduce the incidence of rework (Simpeh, 2012).

The management commitment is one of the most essential factors to implementing quality Management in construction industry; and this factor is considered the most influential according to (Al-Tayeb, 2008). Simpeh (2012) observed that team building, involvement of subcontractor/suppliers during design , design for construction were the most effective design management strategy for reducing rework incidence on construction projects. Furthermore, to reduce rework, Simpeh (2012) found out that the most effective site management strategies for reducing rework are involvement of subcontractors during construction, and quality control.

RESEARCH METHOD

The study covers the analysis of cost of rework on construction project performance with emphasis on time and cost performance of selected public building projects executed

between years 2005 - 2015 in Abuja, Nigeria. The Public building projects considered in the study included Government building projects (administrative and institutional buildings), completed within the period under study. The reason for selecting such projects is that Government is still the largest customer of the construction industry, and public projects are likely to experience large volume of rework and huge amounts of cost and time overruns. This is due to large stakeholders (sub-contractors, suppliers, and professionals) involved in public projects. The period of 10 years (2005- 2015) corresponds with time within which the selected projects were executed. Abuja was selected for this study because it is the administrative headquarters of Nigeria and the ease of access to project archives of the selected companies. Also, being one of the metropolitan cities in Nigeria with the high population of contracting and consulting firms and professionals within the built environment.

A total number of 45 buildings identified to have experienced rework during their execution were selected for the study after contacts with the participants were established. These projects formed the population of the study, together with the participants involved in the delivery of these construction projects. However, in the course of gathering data, access was allowed to only 31 of them. The 31 projects formed the bases of the study, as they were found adequate, as the needed information were available. These numbers were considered adequate for generalization about the whole population to be made. A pro forma was used to collect the data on project costs and time, and rework cost for the projects. These data were extracted by the researchers from the Bill of quantities, valuation and final accounts, claims sheet, and variation accounts. Moreover, structured questionnaires were randomly administered to 365 participants, who were associated with these building projects. These participants constituted professionals who worked with the clients, the contractors, the consultants and sub-contractors; in ensuring that the projects are delivered. 188 of the questionnaires were retrieved out of the 365 distributed, representing 51.5% response rate, and were deemed fit for the analysis.

The questionnaire was designed in two sections using information derived from the review of the related literatures. Section A covered the demographic information of the target respondents. Information gathered from section A served as a quality check and verification of the data from the other part of the questionnaire. Section B covered the views of the project participants on the possible measures for reducing rework in construction, which will in turn minimize or eliminate cost and time overruns for public building projects. 25 possible mitigation measures were selected from the review of the related literatures, and respondents were requested to rate these measures base on the level of efficacy in reducing rework when implemented on construction projects using a 5-point Likert scale, where 1 = very Ineffective, 2 = Ineffective, 3 = Average, 4 = Effective, 5 = very Effective.

The appropriateness and suitability of the research instrument to meet the study objectives was carried out through a pilot survey as suggested by Fellows and Liu (2008). Fifteen of the draft questionnaire were randomly distributed to the selected experts, and the final draft was adjusted based on their feedback. Furthermore, the reliability and internal consistency of the questionnaire was carried out using Cronbach's alpha test. This test measured the reliability of each of the field of the questionnaire and the mean of the entire fields of the same questionnaire. The acceptable value range of Cronbach alpha is between 0.0 and +1.0, and as the value tends toward 1, the higher the degree of internal consistency. The Cronbach alpha value for the measured variables is 0.911, thereby implying that the questionnaire is credible and have high degree of reliability. According to Moser and Kalton (1999), a research instrument is more perfect as the value of the Cronbach alpha tends towards 1.0.

Frequencies, percentages, Relative Importance Index (RII) were used to analyse the collected data from the questionnaire; and Kruskal-Walis test was performed to determine the relationship in the view of the respondents regarding the variables. Furthermore, the project cost, time and rework cost data collected were analysed by using regression and correlation analysis. Regression analysis was employed to determine the relationship between the dependent variables (Project cost) and independent variables (costs of rework), and Pearson product moment correlation coefficient (correlation analysis) was used to examine the relationship between the cost of rework and rework time.

The decision-rule for describing a measure most effective was based on the cut-off; that items with RII of "0.81 to 1.00 are rated "very high (VH)"; 0.61 to 0.80 are rated "High

(H)"; 0.41 to 0.60 are rated "Moderate (M)"; 0.21 to 0.40 are rated "Low (L)"; and below 0.20 are rated "Very Low (VL)" in minimizing rework emergence.

RESULTS AND DISCUSSION

General Information of the Respondents

The analysis of the respondent's characteristic shows that in the organisational type of respondents; 51.60% of them worked with contractors, 20.74% and 25.0% worked in the consultants and clients organisation respectively, and 2.66% worked in the consulting/contracting firms. Moreover, 48.40% of the respondents had 1-10 years of experience, 39.89% had 11-20 years of work experience, 9.04% and 2.66% of the respondents had 21-30years and 31.40years respectively, while none had 41years and above. Most of the participants hold Bachelor of Science/Bachelor of Technology degree (46.28%), this was followed by those with Higher National Diploma (29.79%) and Master of Science/Master of Technology degree (21.81%), and lastly PhD holders (2.13%). This implies that the respondents are experienced and academically qualified to give reliable information in such construction based study. In addition, according to the respondents, 74.5% always keep records of rework incidences, 23.94% keep record sometimes, and only 1.56% of them had never kept records of rework incidences. The respondents are of the opinion that the activities of contractors contribute 37.77% to rework, followed by the consultants (31.38%) and then the client/owner/customer (18.09%).

The analysis also revealed that 32.45% of the respondents were registered Quantity surveyors with the Nigerian Institute of Quantity Surveyors (NIQS). 27.13% were Engineers (Civil and Services) registered with the Nigerian Society of Engineers (NSE), and 23.40% were Architects (registered with the Nigerian Institute of Architects (NIA) respectively. 17.02% of the respondents were Builders registered with the Nigerian Institute of Building (NIOB). The rationale behind the high proportion of quantity surveyors is that they are involved in cost-associated matters such as rework in the construction industry; and evidence of professional memberships shows that they are professionally qualified to give an expert opinion on the subject of this study.

Relationship between Cost of Rework and Project Cost

In order to determine the relation between cost of rework and cost of project, a regression analysis was undertaken and the result is shown in Table 1. The analysis revealed that there is a relationship between the cost of rework (independent variable) and the Projects costs (dependent variables) for the 31 selected building projects studied. In all, it was discovered that there exists a very strong, positive and significant relationship between the variables (that is, between cost of rework and initial project cost, final project cost).

The analysis between the cost of rework and initial project cost shows that the coefficient of determination (R^2) observed has a very high value of 73.8% implying that 73.8% changes in the value of project cost is due to the cost of rework while the remaining 26.2% was due to other factors not considered by this study. The positive correlation observed implies that increase in the value of the independent variable is accompanied by a corresponding increase in the value of the dependent variable and vice-versa. The $F_{calculated}$ value of 81.606 observed was greater than the $F_{tabulated}$ value of 4.18 and the P-value of 0.000 observed was less than 0.05. Based on these, the null hypothesis which stated that there is no significant relationship between the cost of rework and project cost was not accepted.

The analysis between cost of rework and final project cost revealed that the coefficient of determination (R^2) observed has a very high value of 75.0% implying that 75.0% changes in the value of project cost is due to the cost of rework while the remaining 25.0% was due to other factors not considered by this study. The positive correlation observed implies that increase in the value of the independent variable is accompanied by a corresponding increase in the value of the dependent variable and vice-versa. Meaning that any further rework incidence can increase what the value of the final contract sum will be, even after it has been projected at some point during the construction. Since the $F_{calculated}$ value of 87.068 observed was greater than the $F_{tabulated}$ value of 4.18 and the P-value of 0.000 observed was less than 0.05, the null hypothesis was not accepted.

Table 1: Simple Linear Relationships Analysis for Cost Of Rework And Project Cost

Variables	Dependent Variables							
	Initial cost of projects				Final Contract Sum			
	B	SE B	β(beta)	Sig.	B	SE B	β(beta)	Sig.
Constant	1.03E+09	2.77E+08		0.001	1.09E+09	2.91E+08		0.001
Cost of Rework	17.656	1.954	0.859	0.000	19.155	2.053	0.866	0.000
R		0.859				0.866		
R^2		0.738				0.750		
Adjusted R^2		0.729				0.742		
F_{cal}		81.606				87.068		
F_{tab}		4.18				4.18		

Source: Researchers' Analysis (2017)

Relationship between Cost of Rework, Rework Time and Project Delivery Time

The results of the correlation analysis carried out to ascertain if there is a significant relationship among variables such as (cost of rework and rework time) is shown on Table 2. This analysis was achieved using Pearson's (r) correlation; this r-value indicates the strength of the relationship. Overall, the results showed a significant relationship among the variables tested, and in all Pvalue < 0.05.

The relationship between cost of rework and rework time showed a high correlation as the r-value fell within the range recommended by Hikkles *et al*. (1998) in (Oyewobi *et al*, 2011). Hikkles *et al*. (1998) recommended that a correlation coefficient (r) is high when it ranges from 0.70 to 0.90; and moderate when it ranges from 0.50 to 0.70. The correlation between the cost of rework and rework time is high because (74.9%) implies a positive high statistical relationship between the variables. The P-value of 0.000 observed was less than 0.05, based on these, the hypothesis which states that there is no statistically significant correlation between the costs of reworks and rework time was rejected. Thus, as the length of time required to rectify bad work increases, the cost of rework increases too. This is so as the cost of rework is made up of all the resources (time, materials, plant, labour, etc) needed to rectify non-conforming work. Similarly, any increase in rework time will bring about a proportionate increase in project duration, especially where other incidences have exhausted the project float.

Thus, rework time constitutes an average of 3.46% of the initial project duration and 19 days extension to the project duration. Based on this, it was concluded that rework is a major cause of time overrun and there is a significant relationship between rework and project delivery time. Increase in rework will lead to a corresponding increase in project duration, thus, projects deliverables will be delayed.

Table 2: Simple Linear Relationship between cost of rework and rework time

	Cost of Rework	Rework Time
Cost of Rework	1	.749**
Rework Time	.749**	1

Source: Researchers' Analysis, 2017

**. Correlation is significant at the 0.05 level (2-tailed).

**. Correlation is significant at the 0.01 level (2-tailed).

The analysis of the data collected from a total of 31 selected public building projects revealed that, in all there exists a very strong, positive and significant relationship between the variables (cost of rework, project cost and project duration) tested. This implies that an increase in the cost of rework can cause additional cost to the project which could require extra time. This finding is consistent with the following previous studies on rework; Oke and Ugoje (2013) who reported that there is a significant relationship between rework cost and initial cost, final cost, cost overrun, initial time, final time and time overrun. Oyewobi *et al*. (2011a) reported a positive link between rework cost and project time overrun at 5% level of significant; there was a positive correlation between rework and initial cost, cost overrun and time overrun of the projects studied at 1% level of significant. This therefore indicates that increase in cost of remedying nonconforming work will give rise to increase project completion time. Ajayi and Oyeyipo (2015) reported that there is significant relationship between the cost of rework and initial contract sum, initial and final contract period; but not with the of final contract sum.

A further analysis of the data revealed that rework represent 3.53% and 3.28% of the initial and final project cost respectively and constituted 46.6% of the cost overruns experienced in the 31 selected projects. Similarly, time overrun due to rework represent 7.35% and 6.85% of the initial and final project duration respectively, with these, rework lead to an average of 19 extra days to the durations of the projects studied. This finding corroborates previous studies on rework (Chan and Kumaraswamy, 1997; Love, 2002a; Love and Edwards, 2004a; Hwang *et al*., 2009). These studies agreed that rework is the main cause of (and significant contributor to) cost and time overrun. It is also consistent with Burati *et al*., (1992), Wasfy (2010), Love and Edwards (2004a), who posited that rework adversely affect construction project performance in form of cost overruns, time overruns, schedule slippage, quality degradation, dissatisfaction, additional labour and plant, reduced project scope, conflict and professional relations.

Previous studies with higher rework cost value; Love (2002a) reported that rework would naturally increase total project costs by 12.6%. Davis *et al*. (1989) reported that rework can cause additional cost to construction of up to 12.4% of the total project cost. Gunawardena *et al*. (2004) revealed that the cost of rectifying non-conformance (rework) is on the average of 10% of total contract sum. Burati *et al*. (1992) discovered that deviation in project quality accounted for 12.4% of the total project cost of engineering projects. Egan (1998) reported a high rework cost in building projects of 30%. Love *et al*. (1999) discovered that the cost associated with poor quality work (such as rework due to poor workmanship) were as high as 12% of the total project budgets and will require 11% of the total project schedule to remedy. Abeku *et al*. (2016) reported a combined effect of rework on the projects' time and cost of 54.75 and 28.20% respectively.

Other studies which reported same, lesser or slightly higher rework cost value; Marosszeky (2006) reported that the mean of rework costs were 5.5% of the value of the contract; comprising 2.75% direct costs, 1.75% and 1% indirect costs for main contractors and subcontractors respectively. Low and Yeo (1998) posited that a typical contractor in the construction industry spends an average of 5 -10% of the total project budget in producing poor quality works and remedying them later. Josephson and Hammarlund (1999) stated 2% - 6% of contract sum is the cost of rectifying and redoing works which do not conform to quality in the construction projects. Love and Li (2000) reported the cost of redoing and rectifying poor quality in residential building projects to be 3.15% and for industrial building projects is 2.40% of the contract sum. Meshksar (2012) reported that the cost of rework is 1.30% - 3.30% of contract value, and an average of 2.095%; and rework time of 3.0%-8.0% with an average of 5.182%. Oyewobi *et al*. (2011a) reported that on elemental basis, rework costs was as high as 5.29%; and that rework costs constitutes 3.47% of the entire projects studied. For high way project, Abdul-Rahman (1995) reported a lower cost of non-conformance of 5% of contract sum. Josephson *et al* (2002) estimated that the cost of non-conformance amounted to 4.4% of the construction values, and 7.1% of total construction work hours.

Having reported that rework cost can naturally be up to 12.6% of project cost, Loves (2002a) argued that some construction projects are capable of showing high cost of rework costs. Implying that rework incidences and their associated costs impact can be lower or higher in the construction industry.

Rework Minimisation Measures

In order to establish the best possible measures of minimising rework incidences in public projects, the respondents were asked to rank the measures identified from literature based on their level of effectiveness in reducing/avoiding their occurrences when implemented. Table 3 shows the ranking of these measures. Kruskal-Walis test was further conducted to determine the consistency in the perception of the four sets of professionals. This test is suitable for use where there is need to establish a significant difference in the views of three or more groups of respondents.

It is obvious that the top five most effective measures of minimizing rework as suggested by the Builders are: Team building and education, Communication between managers and employees, Design for construction (i.e standardised components), Value management, and Management commitment. While, the Quantity Surveyors are of the opinion that Team building and education, Management commitment, subcontractor/suppliers during design, Employee involvement, and Involvement of subcontractors during construction, are most effective measures for reducing rework.

In the opinion of the Architect, Design for construction (i.e standardised components), Team building and education, Communication between managers and employees, Management commitment, and involvement of

subcontractor/suppliers during design and Employee involvement with tied RII of 0.850; are the most effective for reducing construction rework. For the Engineers; Team building and education, Involvement of subcontractor/suppliers during design, Management commitment, Employee involvement, and Communication between managers and employees; are most suitable measures of reducing construction rework.

On the overall, the most effective means of reducing construction rework are: Team building and education, Management commitment, Employee involvement, Communication between managers and employees, Involvement of subcontractor/suppliers during design, Design for construction (i.e. standardised components), Involvement of subcontractors during construction, and Review/analysis used to improve performance. These were based on the criteria set for the identification of measures that are effective in minimizing rework, eight (8) of the measures which fell within (RII 0.81-1.0) were identified.

Table 3: Rework Minimization Measures

Measures	Bldr.		Q. S		Arch.		Engr.		Overall		Kruskal-Walis	
	RII	Rank	RII	Rank	RII	Rank	RII	Rank	RII	Rank	Chi Sq	P-value
Team building and education	0.91	1	0.92	1	0.88	2	0.93	1	0.910	1	2.722	0.436
Communication between managers and employees	0.86	2	0.82	6	0.86	3	0.84	5	0.840	4	1.7	0.637
Design for construction (i.e standardised components)	0.86	3	0.8	15	0.89	1	0.77	15	0.828	6	8.178	0.042*
Involvement of subcontractor/suppliers during design	0.74	17	0.88	3	0.85	5	0.85	2	0.830	5	3.785	0.286
Organisational culture	0.7	23	0.78	18	0.67	24	0.67	23	0.710	23	8.223	0.042*
Value management	0.84	4	0.72	22	0.77	15	0.76	17	0.771	16	4.14	0.247
Constructability analysis	0.76	13	0.68	25	0.78	13	0.76	18	0.740	20	3.628	0.304
Review/analysis used to improve performance	0.81	7	0.79	17	0.83	7	0.83	6	0.814	8	0.658	0.883
Computer visualisation techniques	0.75	15	0.8	11	0.77	15	0.78	13	0.775	14	0.974	0.807
Employee involvement	0.83	6	0.87	4	0.85	5	0.84	4	0.840	3	1.363	0.714
Involvement of subcontractors during construction	0.81	7	0.86	5	0.81	9	0.78	11	0.820	7	1.768	0.622
Clearly defined goals and objectives	0.67	25	0.77	20	0.66	25	0.66	24	0.690	25	6.234	0.101
Design scope freezing	0.76	13	0.8	11	0.8	12	0.8	9	0.788	13	0.779	0.854
Quality control plan	0.79	9	0.8	13	0.78	14	0.78	11	0.789	12	0.083	0.994
Site quality management system	0.79	9	0.76	21	0.82	8	0.82	7	0.798	11	1.789	0.617
Regular inspections and audits	0.71	20	0.78	19	0.71	23	0.71	22	0.730	22	2.685	0.443
Value engineering	0.74	18	0.81	7	0.75	19	0.76	18	0.760	17	0.774	0.856
Management commitment	0.84	4	0.89	2	0.85	4	0.85	3	0.860	2	3.719	0.294
Well-defined roles and responsibilities	0.78	11	0.81	7	0.81	9	0.82	8	0.806	9	0.382	0.944
Written quality programme or policy	0.75	15	0.79	16	0.77	15	0.78	13	0.772	15	1.188	0.756
use of information technology	0.7	23	0.7	24	0.73	22	0.65	25	0.690	24	2.146	0.543
Supervisors training	0.71	21	0.8	13	0.76	18	0.77	16	0.760	18	2.192	0.533
Reduction of client/contractor oriented changes	0.71	21	0.81	9	0.74	21	0.75	20	0.750	19	4.376	0.224
Skilled workforce	0.78	11	0.81	9	0.81	9	0.8	9	0.800	10	0.268	0.966
Regular meetings	0.74	18	0.7	23	0.74	20	0.75	20	0.730	21	1.006	0.800

N = 32 for Building, N = 61 for Quantity Surveyor, N = 44 for Architect, N = 51 for Engineering, df = 3

Source: Researchers' Analysis (2017)

Kruskal-Walis test carried out at 95% confidence level, showed that there is a significant difference in the ranking of two (8%) of the measures for reducing the rework incidences in public buildings as indicated by the four categories of respondents. These measures recorded p-values of less than 0.05, and they are Design for construction (i.e standardised components), and Organisational culture. The differences can be attributed to the ways the 4 categories of respondents view these measures. However, the test also shows that there is no significant difference in the ranking of 23 (92%) of the measures for reducing the rework incidences in buildings projects as perceived by the respondents. These measures recorded a significant p-value of above 0.05. Since, 92% of the measures are effective for reducing construction rework when implemented; it was then concluded that there is agreement among the respondents regarding the measures for minimising rework incidences in construction works. This was supported by a further analysis using the RII of each group for all the measures which shows on Table 4, that the measures recorded a significant p-value of above 0.05.

Table 4: Results of Kruskal-Walis Test across the 4 categories of Respondents

Experts	Means Rank	Chi - Square	P-value	Remark
Builders	44.04	2.788	0.425	Measures are effective
Quantity Surveyors	57.24			
Architects	52.14			
Engineers	48.58			

N (number of measures) = 25, df = 3

The analysis revealed that the top most effective means of reducing construction rework are Team building and education, Management commitment, Employee involvement, Communication between managers and employees, and Involvement of subcontractor/suppliers during design. This finding corroborates with the report of Simpeh (2012), who reported that team building, involvement of subcontractor/suppliers during design , design for construction were the most effective design management strategy for reducing rework incidence on construction projects. Simpeh (2010) observed that the involvement of subcontractors during construction, quality control are the most effective site management strategies for reducing rework. Peter et al. (2010) emphasis the role of skilled work force, good communication, employee involvement and management commitment in improving quality and curtailing waste and rework in construction. It is obvious that the participation of subcontractors at both the planning and construction stage will lead to increased effective communication between subcontractors and their main contractors. This will translate to effective and proper coordination of site activities, which will eventually reduce the incidence of rework (Simpeh, 2012).

The management commitment is one of the most essential factors to implementing quality Management in construction industry; and this factor is considered the most influential according to (Al-Tayeb, 2008). Management support and commitment is therefore, critical if rework is to be reduced to a minimum. Love and Edwards (2004a) posited that constructability and Value Management (VM) programmes are key activities to be undertaken after the creation of baseline scopes. Furthermore, for design-related rework to be reduces, the key strategies include constructability analysis, team building, value management and scope freezing (Love, 2001). Therefore, if management seek to reduce investment in wasteful activities, value management should be performed at the early stages of project development; and should involve project team, contractors and subcontractors (Love and Edwards, 2004a).

CONCLUSION AND RECOMMENDATIONS

The study covers the analysis of cost of rework on construction project performance with emphasis on time and cost performance of selected public building projects, with a view to determining the most effective measures of reducing rework occurrence on construction projects. The study revealed a very strong, positive and significant relationship between the cost of rework and project cost; and strong, positive and significant relationships between the costs of rework and project duration. This showed that rework is a major cause of cost and time overrun experienced in construction projects. Furthermore, it was revealed that team building and education, Management commitment, Employee involvement, effective communication between managers and employees, and Involvement of subcontractor/suppliers during design, are the most effective measures of minimizing rework.

Based on these findings, it can be concluded that rework contribute significantly to cost and time overruns experienced in building construction projects; and that rework can be effectively minimised to improve project cost and time performance.

The study therefore, recommends that project participants should be alert, have a good foresight in identifying rework triggers, and eliminate them prior to commencement of work on site to avoid rework emergence at construction. This will greatly check their occurrence and the cost and time performance of construction projects would be improved. There should be efficient and effective communication among the design consultants, engagement of adequately skilled professionals to complete contract documents prior to awards, ensures involvement of entire project team and the contractor and subcontractors should not be excluded in finding lasting solution to reducing rework incidences. Also encouraged is the development of teambuilding and relationship models that will stimulate inter-

organizational relations and promote good team spirit at the inception stages of a project, which is will have impact on reducing design-induced rework. A further study should be carried out to explore the effect of relationship between the effect of rework on private and public building projects.

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ASSESSMENT OF LEADERSHIP CAPABILITY IN THE NIGERIAN CONSTRUCTION INDUSTRY FOR EFFECTIVE PROJECT DELIVERY

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The major heartache of the stakeholders in the construction industry is the lack of pragmatic approach for efficient project management and delivery. This could be addressed through manpower resources, high managerial capability and competency of the leader charged with the responsibility . Leaders are men who conceived projects from the design stage, are involved in its execution to completion and makes hard decisions at every stage of the project life. Modern projects which requires a qualified, skillful and efficient person to lead the team effectively. As outlined in this paper, the rationale is to determine the capability and the competency of leaders in the Nigerian construction industry in line with the most important leadership skills and styles required for successful completion of construction projects. This research paper present list of leadership functions, skills and styles, identified from the literature. The opinions of construction experts on the skills and styles identified was obtained through self administered questionnaires. The questionnaire survey was administrered to project managers, project heads, site engineers, site supervisors, and foremen. Frequency Analysis, Average Index and Relative importance index were employed in analyzing the data. The results revealed that the skills and styles of Leadership in order of importance for major construction projects and the ways to improve or strengthens leadership capability and competency are found. The correlation coefficient of the measure of the relationship between leadership capability and effective project delivery in the construction industry in Lagos state was 0.31 ($p = 0.022$). The null hypothesis (H_0) is rejected and it is concluded that there is a weak, significant positive relationship between leadership capability and effective project delivery in the construction industry in Lagos State ($p < 0.05$). The model fitted was **Project delivery = 49.565 + 0.419* leadership capabilities** for estimating, project delivery knowing the leader's capability. Findings revealed that with higher the leadership capabilities and managerial skills, the faster the project delivery in the construction industry in Nigeria.

Keywords: Correlation, leadership capabilities**,** project delivery

INTRODUCTION

In the vein of the present movement of transforming one of the densely populated black nations in the world, heavy infrastructural projects replace the existing ones and major sophisticated construction project springs up daily. The observation to the successful completion of such projects efficiently, have depicts leadership frenzy appropriateness and capability among the other reasons amidst the stakeholders in the construction industry.

Leadership, being the act and the skill of leading people (project team) setting direction and influencing them to follow and to achieve a set goal. Maxwell (1993). Leadership is one of the most important and essential factors in project execution, management and delivery. Walker (1999) defines leadership as the manner in which the project leader conducts themselves in their role, in order to obtain the best performance from the people they are leading.

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Numerous literatures, Vroom and Jago (2007), Bennis (2007), Avolio (2005), Thor and Ofori (2008), reject a strict single definition of leadership rather questioned and argued persistently whether leaders are born or made and whether there is a difference between leadership and management. The leader is responsible for the performance of their team and the achievement of their goals. Also, Suresh (2009), an ardent advocate, emphasised that the construction leader who has good and high skills can alter and modify their approach to overcome challenges and guarantee success.

The construction industry has a greater need for leadership than any other field of endeavor has emphasized by Ofori (2008) and afterward summarized reasons that sustain this argument thus: first, "construction projects are large and technically complex and they involve a combination of specialized skills. Thus, the teams are not only large, but also multi-disciplinary, multi-cultural and from several different organisations. Second, the projects are typically expensive and the stock of buildings represents a large proportion of a nation's savings. Thus, the quality of the built product is of the essence. Thor (2012), stresses thirdly that the projects take a long time to complete and involve a large number of discrete activities, which increases certain time-related risks and exacerbate problems with communication, co- ordination and the ability to manage a wide range of risks. He further finally pointed out that projects and the constructed product have serious implications for the health and safety of the workers involved, as well as the general public. Thus, due care, diligence and expertise are necessary safeguards". This underscores the importance of leadership in the management of people oriented project since leadership is a key factor for success in any activity that involves collaboration among a group of people. As any project's success is generally defined on the basis of time, cost, or quality, we cannot diminish the impact of key individuals on the project's ultimate success or failure.

Umeora (2013), supported his argument with the fact that incessant cases of building collapse and project performance deficiencies such as cost and time overruns, poor work quality, technical defects, poor durability of projects, as well as inadequate attention to safety, health and environmental issues are more prevalent in developing countries than elsewhere. This can only be piloted on appropriation of an effective leader in construction; thus corroborate that leadership capability more acute. Despite this recognition that leadership is important at all levels of the construction industry, emphasis has been on the technical and management aspects, and leadership receives inadequate attention.

This study sets out to understand the contributions of the capabilities of the leadership in the construction in industry for effective project delivery in Nigeria by answering the following questions: What are the capabilities of leadership in project delivery in the construction industry? What are the leadership skills identified among leaders in the construction industry in Nigeria? And what are the factors affecting project delivery in the construction industry in Nigeria?

Research Hypothesis

H_0: There is no significant relationship between leadership capability and effective project delivery in the construction industry in Nigeria.

H_1: There is a significant relationship between leadership capability and effective project delivery in the construction industry in Nigeria.

METHODOLOGY

Self-administered structured questionnaire survey was used to answer the objectives of the study. This method is easier and demands less time to complete for data collection and analysis *(Wuensch, 2005). With the adoption of Likert rating, information were obtained from the respondents.* In analyzing the data, frequency distributions, means and standard deviation, correlation and regression analysis were employed while Statistical Software for Social Sciences (SPSS 23) was used in analysing the collected data.

RESULT AND FINDINGS

The demography of the respondents revealed that 85.2% of them are male, 87% are 25 years or more, 61.1% are married, 63% had worked for over 5 years in their current organisations and 67% have been in the industry for over 5 years . 44% of the respondents

are consultants, 51.9% are contractors and only 3.7% are clients. 42.6% are members of the Nigerian Institute of Building (NIOB), 24.1% are from Nigerian Institute of Quantity Surveying (NIQS), 18.5% from the Nigerian Institute of Architectures (NIA), 13% from the Nigerian Society of Engineers (NSE) , while only 1.9% of them belong to other professional associations.

In addition, the table also shows that 42.6% of the respondents are Project managers, 44.4% are supervisors, 7.4% are foremen while 5.6% constitute others. Lastly, while Only 3.7% of the respondents hold a doctorate degree in a construction related field, 44.4% hold Master of .Science (M.Sc)., 38.9% are first degree holders, 13% hold ND/NCE certificate.

The analysis indicates higher level of responsibility (male), academic education (Master) and experiences in project delivery (Professional in the building institute with a decade of experiences)

Research Question one: What is the functions of leadership in project delivery in the construction industry?

Table 1 shows that 100% of the professionals rated proper planning of projects as important or very important leadership function, 88.9% rated developing the knowledge and skills of members, 94.4% rated effective communication among members and 90.7% rated leading the construction team toward ultimate objectives as important or very important leadership function.

In addition, 92.6% viewed identifying key time, cost, quality constraint as important or very important, 83.3% rated handling changes in the design and design development, 90.8% rated creating a supportive work environment for the project participants and 88.9 rated ads in harmonizing goal and preventing conflict management in construction projects as important or very important leadership function in the construction industry.

Furthermore, 87% viewed resource control in construction projects as important or very important, 85.2% rated helping in creating group cohesiveness which helps in proper utilization of the team work, 62.9% rated helping to manage cultural issues during construction process and 96.3% rated coordination of the construction process as important or very important leadership function in the construction industry.

Table 1: Capabilities of leadership in project delivery

S/N	Leadership functions in construction.	Very important	Important	Relatively important	Less important	Not important
1.	Proper planning of projects	50 (92.6)	4 (7.4)	-	-	-
2.	Develop the knowledge and skills of members	21 (38.9)	27 (50)	6 (11.1)	-	-
3.	Ensure effective communication among members	31 (57.4)	20 (37)	3 (5.6)	-	-
4.	Lead construction team toward ultimate objectives	35 (64.8)	14 (25.9)	4 (7.4)	1 (1.9)	-
5.	Identifying key time, cost, and quality constraint.	31 (57.4)	19 (35.2)	4 (7.4)	-	-
6.	Handles changes in the design and design development.	23 (42.6)	22 (40.7)	8 (14.8)	1 (1.9)	-
7.	Creating a supportive work environment for the project participants.	21 (38.9)	28 (51.9)	3 (5.6)	2 (3.7)	-
8.	Aids in harmonizing goal and preventing conflict management in construction projects.	23 (42.6)	25 (46.3)	5 (9.3)	1 (1.9)	-
9.	Resource control in construction projects	24 (44.4)	23 (42.6)	5 (9.3)	2 93.7)	-
10.	Helps in creating group cohesiveness which helps in proper utilization of the team work.	27 (50)	19 (35.2)	6 (11.1)	2 (3.7)	-
11.	Helps to manage cultural issues during the construction process.	20 (37)	14 (25.9)	15 (27.8)	2 (3.7)	3 (5.6)
12.	Coordination of construction process.	32 (59.3)	20 (37)	2 (3.7)	-	-
13.	Implement policies and procedure in construction projects.	25 (46.3)	20 (37)	8 (14.8)	1 (1.9)	-
14.	Maintains project objectives.	33 (61.1)	15 (27.8)	3 (5.6)	3 (5.6)	-
15.	Motivate other workmen to achieve results on construction projects.	32 (59.3)	15 (27.8)	5 (9.3)	2 (3.7)	-

Lastly, 83.3% rated implementing policies and procedure in construction projects as important or very important leadership functions, 88.9% viewed maintaining project objectives and 87% rated motivating other workmen to achieve results on construction projects as important or very important leadership function in the construction industry.

Research Question two: What are the leadership skills identified among leaders in the construction industry in Nigeria?

Table 2 reveals the relevant leadership skills identified in the construction industry in Lagos State. 96.3% identified communication skills (oral & written) as relevant or most relevant skills, 98.1% motivating and promoting, 96.3% identified honesty and the development of trust, and 83.3% identified self-awareness.

In addition, others skills identified are: teamwork and delegation (92.6%), flexibility (90.7%), achievement of targets (98.1%) and goal orientation (96.3%).

Furthermore, 98.1% identified team building, formation and development as relevant or most relevant skills, 94.6% identified persuasiveness, 98.1% identified leading by example and 94.4% identified assertiveness, willingness to assume responsibility as relevant or very relevant skills in the construction industry.

Lastly, other skills identified were: people orientation (89.9%), technical expertise (98.1%), problem identification and solving (92.6%) and emotional balance (87%).

Table 2: Leadership skills identified among leaders in the construction industry

S/N	Effective Leadership Skills	Most relevant	Relevant	Partially relevant	Not relevant
1.	Communication skills – oral & written.	46 (85.2)	6 (11.1)	2 (3.7)	-
2.	Motivating and promoting.	27 (50)	26 (48.1)	1 (1.9)	-
3.	Honesty and development of trust.	28 (51.9)	24 (44.4)	2 (3.7)	-
4.	Self-awareness	23 (42.6)	22 (40.7)	7 (13)	2 (3.7)
5.	Teamwork, delegation.	36 (66.7)	14 (25.9)	3 (5.6)	1 (1.9)
6.	Flexibility.	25 (46.3)	24 (44.4)	4 (7.4)	1 (1.9)
7.	Achievement of targets.	38 (70.4)	15 (27.8)	1 (1.9)	-
8.	Goal orientation.	30 (55.6)	22 (40.7)	1 (1.9)	1 (1.9)
9.	Team building, formation, development.	34 (63)	19 (35.2)	1 (1.9)	-
10.	Persuasiveness.	29 (53.7)	22 (40.7)	2 (3.7)	1 (1.9)
11.	Leading by example.	38 (70.4)	15 (27.8)	1 (1.9)	-
12.	Assertiveness, willingness to assume responsibility.	32 (59.3)	19 (35.2)	3 (5.6)	-
13.	People orientation.	23 (42.6)	25 (46.3)	6 (11.1)	-
14.	Technical expertise.	37 (68.5)	16 (29.6)	1 (1.9)	-
15.	Problem identification and solving.	31 (57.4)	19 (35.2)	4 (7.4)	-
16.	Emotionally balanced	30 (55.6)	17 (31.5)	6 (11.1)	1 (1.9)

Research Question three: What are the factors affecting project delivery in the construction industry in Nigeria?

Table 3 revealed that 92.6% viewed effective leadership role as either critical or very critical in the effective project delivery, 94.4% viewed cost as either critical or very critical in effective delivery, 96.3% viewed time as either critical or very critical in the effective project delivery and 96.3% rated the quality as critical or very critical in effective project delivery. In addition, 87% viewed participant satisfaction as critical or very critical in the effective project delivery, 74% rated user expectation as critical or very critical in the effective project delivery, and 88.9% rated safety as critical or very critical in effective project delivery.

Table 3: Measures of the factors enhancing effective project delivery.

s/n	Project delivery	Very critical	Critical	Less critical	Not critical
1.	Effective leadership role	43 (79.6)	7 (13)	4 (7.4)	-
2.	Cost e.g. variation cost and modification cost	37 (68.5)	14 (25.9)	2 (3.7)	1 (1.9)
3.	Time	35 (64.8)	17 (31.5)	2 (3.7)	-
4.	Quality e.g. technical specification	41 (75.9)	11 (20.4)	1 (1.9)	1 (1.9)
5.	Participant satisfaction	24 (44.4)	23 (42.6)	6 (11.1)	1 (1.9)
6.	User expectation	20 (37)	20 (37)	10 (18.5)	4 (7.4)
7.	Safety	29 (53.7)	19 (35.2)	5 (9.3)	1 (1.9)
8.	Environmental performance	26 (48.1)	21 (38.9)	5 (9.3)	2 (3.7)
9.	Good organisation strategic planning and management process	31 (57.5)	16 (29.6)	5 (9.3)	2 (3.7)

Lastly, 87% of the respondents viewed environmental performance as critical or very critical in effective project delivery while 87% viewed Good organisation strategic planning and management process as critical or very critical in effective project delivery.

Research Question four: What are the suggested ways of improving on leadership capabilities in the construction industry in Lagos state?

Table 4 shows all the suggested ways to improve on project delivery among leaders in the construction industry. 87.1% suggested leadership development workshop, 88.9% suggested motivation, 87.4% suggested focusing on developing existing talents and 94.4% suggested retaining talents. Also, other suggestions were: improving manager skills (98.1%), driving innovations (88.9%), self-motivation, inspiration (92.6%), and individual training (88.9%). In addition, others suggested general management training (96.3%), mentoring (81.5%), investing in strengthening leadership capability (87.1%), and financial benefits (68.5%). Furthermore, 83.3% suggested giving leaders time and space to think strategically, 94.4% suggested industrial training, 57.4% suggested parental training and 83.3% suggested ensuring project managers are equipped to drive leadership capability. Lastly, other suggested improvements include, increased collaboration between clients, construction teams and other stakeholders (90.7%), improve leaders' communication skills (92.6), acquisition of modern ICT tools for construction leaders (85.1%) and imbibing good and godly characters in leaders (64.8%).

Table 4: Ways of improving on leadership capabilities.

S/N	Ways to improve leadership capability.	SA	A	N	D	SD
1.	Leadership development workshop.	28 (51.9)	19 (35.2)	6 (11.1)	1 (1.9)	
2.	Motivation	23 (42.6)	25 (46.3)	6 (11.1)		
3.	Focus on developing existing talents	28 (51.9)	17 (31.5)	7 (13)	2 (3.7)	
4.	Retain talents.	27 (50)	24 (44.4)	1 (1.9)	1 (1.9)	1 (1.9)
5.	Improve manager skills.	27 (50)	26 (48.1)	1 (1.9)		
6.	Drive innovations.	31 (57.4)	17 (31.5)	6 (11.1)		
7.	Self-motivation, inspiration.	31 (57.4)	19 (35.2)	4 (7.4)		
8.	Individual training.	30 (55.6)	18 (33.3)	6 (11.1)		
9.	General management training.	28 (51.9)	24 (44.4)	2 (3.7)		
10.	Mentoring.	29 (53.7)	15 (27.8)	10 (18.5)		
11.	Investing in strengthening leadership capability.	30 (55.6)	17 (31.5)	6 (11.1)	1 (1.9)	
12.	Financial benefit.	22 (40.7)	15 (27.8)	16 (29.6)	1 (1.9)	
13.	Give leaders time and space to think strategically.	21 (38.9)	24 (44.4)	8 (14.8)	1 (1.9)	
14.	Industrial training.	32 (59.3)	19 (35.2)	3 (5.6)		
15.	Parental training.	13 (24.1)	18 (33.3)	13 (24.1)	7 (13)	3 (5.6)
16.	Ensure project managers are equipped to drive leadership capability.	29 (53.7)	16 (29.6)	8 (14.8)	1 (1.9)	
17.	Increase collaboration between clients, construction teams and other stakeholders.	36 (66.7)	13 (24.1)	5 (9.3)		
18.	Improve leaders' communication skills.	33 (61.1)	17 (31.5)	4 (7.4)		
19.	Management should acquire modern ICT tools to construction leaders.	28 (51.9)	18 (33.3)	7 (13)	1 (1.9)	
20.	Imbibe good and godly characters in leaders.	25 (46.3)	10 (18.5)	18 (33.3)	1 (1.9)	

SA = Strongly Agreed, A = Agreed, N = Neutral, D = Disagreed, SD = Strongly Agreed

Table 5: The correlation coefficient between effective project delivery and leadership capabilities in the construction industry

Variables	Mean	Stdev.	N	R	P	Remarks
Leadership capabilities in the construction industry	87.55	7.84	54	0.31	0.022	Significant
Effective Project delivery	86.26	10.57				

The correlation coefficient of the measure of the relationship between leadership capability and effective project delivery in the construction industry in Nigeria was 0.31 with a p-value of 0.022. The null hypothesis (H_0) is rejected and it is concluded that there is a significant relationship between leadership capability and effective project delivery in the construction industry in Nigeria ($p < 0.05$). The implication is that with higher (more) leadership capabilities, project delivery in the construction industry in many parts of Nigeria will be more effective and successful.

Table 6: Modelling project delivery with effective capabilities of leadership in the construction industry

Variable	Coefficients	Std error	T	P
Constant	48.565	15.606	3.176	0.003
Leadership capabilities	0.419	0.178	2.361	0.022
	$F_{1,52}$ = 5.574; p = 0.022; R^2 = 0.097			

The model fitted for project delivery is given as:

Project Delivery = 48.565 + 0.419*Leadership Capabilities

This result implies that a percent increase in leadership capability will increase project delivery by 0.42% in the construction industry and this contribution of leadership capability is significant ($p < 0.05$). However, in the absence of leadership capabilities, project delivery will be in the region of 48%. The coefficient of determination (R^2) of 0.097 implies that leadership capabilities only accounts for 9.7% of the total variability in project delivery in the construction industry.

Findings

The following are the findings from the research:

- All the leadership functions in the construction industry identified during the cause of the study were perceived to be very important in a construction project delivery. All (100%) of the respondents rated 'Proper planning of project' as very important, a high percentage (96.3%) rated 'Coordination of the construction process' as an important leadership function in the Nigeria construction industry.
- The best and most effective skills a good leader handling construction project must possess is " leadership by example" and "expertise in technical aspects."
- Transformational leadership style, i.e. ability to demonstrate self confidence and conviction, inspiring workers to perform at a higher level and a host of others should be adopted for use during construction projects as identified by respondent in respect of transactional and laissez –faire leadership style.
- Effective leadership role was identified as the most critical factors which catalyzes effective project delivery in the construction industry.
- Construction organizations and individuals must improve their various managerial skills and also engage in general periodic managerial training so that they can effectively manage a construction project by ensuring timely completion, within cost and to specified standards.

CONCLUSIONS

Leadership is an important skill of a project manager. It is the project manager's responsibility to develop leadership and people skills. The two major challenges in the industry in terms of leadership seem to be the lack of skills and the lack of experience by the project managers. Communication and people skills are seen as important skills to be applied by a project manager, yet it is not very successfully applied or developed.

Project management in the building industry needs to be efficient and success oriented. The impact of losses and damages can be large; therefore it is primarily the leader's responsibility to ensure effective and efficient management of the project. The research identified that recognition of effective and successful leaders within the construction industry would help to promote leadership and inspire others. Self motivation and inspiration were regarded as key factors in developing leadership potential and certainly two of the important traits of a project manager are management and leadership skills. When these two project management traits are successfully combined and applied, the success rate of the project will most probably increase.

Conclusively, through extensive study it was deduced that with higher (more) leadership capabilities, project delivery in the construction industry in Nigeria will be more effectively successful.

RECOMMENDATIONS

As a results of strong cases, the study therefore recommends that:

1. Construction companies should focus more on leadership development programmes tailored specifically for construction industry professionals. These leadership

development programmes should include education and training (particularly communication skills and general management training), work experience, mentoring schemes and secondment programmes.

2. They should also include strategies for identifying the leaders of the future, and for rewarding and celebrating success.
3. Construction industry must look to positively develop its working cultures and to break down any organisational barriers that do not recognise, and provide opportunities for those that show leadership potential. This is in line with the belief of The Chartered Institute of Building (CIOB).
4. Transformational leadership style should be practiced while celebrating and communicating leadership successes on construction projects, which raises individual's profile should also be continued where it exists, and developed where it doesn't.

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EFFECT OF MOTIVATION STRATEGIES ON LABOUR OUTPUT OF SMALL AND MEDIUM CONSTRUCTION CONTRACTORS IN NIGERIA

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The design of motivational strategies and their subsequent effect on productivity have not received intense research attention, a situation that appears to encourage stagnation in the workers' productivity. In addressing this problem, this study examined the effect of motivational strategies adopted by small and medium construction companies (construction SMEs) on the productivity of their workforce using a quantitative research design. A convenience sample of 48 SMEs was drawn from a population of 84 firms registered with the Federation of Construction Industry (FOCI). Questionnaires and checklists were employed for data collection, which was then analyzed using Percentages, Correlation analysis and Independent Sample T – Test. The findings from the analyses revealed that a significant relationship exists between financial motivation and the output of bricklayers and blocklayers; non-financial motivation and output of tilers. It was also found that differences in the monetary values of financial and non-financial motivation applied to craftsmen were not significant. It was recommended that SMEs in the construction industry could focus on the use of financial motivation strategies, since these have been found to positively influence output in two trades.

Keywords: Construction SMEs, Contractors, Effect, Labour output, Motivation strategies.

INTRODUCTION

Construction investment accounts for over 60% of the Gross Fixed Capital Formation (GFCF) in Nigeria, which is why the industry is described as the barometer for economic performance in most developing countries (Kazaz and Ulubeyli, 2004; Chitkara, 2006). Due to its critical importance to the profitability of most construction projects, productivity is one of the most frequently used performance indicators to assess the success of a construction project. The importance of motivated employees cannot be highlighted enough in an organizational context, since labour costs comprise 30 to 50% of the overall project cost (Jarkas and Bitar, 2012). Anything done to the employees could either make or mar the quality of their work, the speed of progress, the economy of the country and the social well-being of the workers. It follows from the foregoing therefore that workers should be well motivated for high performance and for the production of good quality products. However, despite this significant role the construction industry plays in the Nigerian national economy, the performance has not been impressive. Poor labour productivity is a major contributor to the frequent delays on many projects; consequently these projects suffer a serious cost overrun (Alberta, 2011). Slowing economic growth and increased competition compel construction companies to look for ways of improving performance while keeping costs down. Motivation has been suggested as a likely solution in this regard (Odesola and Idoro, 2014). Little information was however found on the effect of financial and non-financial incentives on the productivity of construction operatives in 6 selected trades (bricklaying, blocklaying, concreting, plastering, painting and tiling).

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This was the problem that necessitated this study, which attempted to answer the following questions:

i. What are the motivational strategies employed by construction SMEs to improve labour productivity of their work force?

ii. What relationship exist between construction SMEs motivational strategies and labour productivity?

iii. How can the monetary value of different motivational strategies be compared?

LITERATURE REVIEW

The Concept of Productivity in the Construction Industry

Productivity measures how efficiently resources are employed; it is defined as the ratio of a specific measure of output to a specific measure of input per unit of labour. Shan, Zhai, Goodrum, Haas and Caldas (2015) and Williams (1997) defined human capital (labour) as the accumulated knowledge, skill and experience of the labour force. As individual workers acquire more human capital, their productivity and hence their income grows. Most economists would agree with the importance of productivity to an individual enterprise, an industry, or an economy. Unfortunately, no such agreement exists when it comes to defining precisely what 'productivity' actually is and which of the numerous alternative approaches to productivity measurement is suitable for a given task.

The term 'productivity' is generally used to denote a relationship between output and the associated inputs used in the production process. Consequently, construction productivity can be regarded as a measure of outputs which are obtained by a combination of inputs. In view of this, Rakhra (1991) and Shah and Admane (2016) used at least two measures of construction productivity: (1) total factor productivity, where outputs and all inputs are considered; and (2) partial factor productivity, often referred to as single factor productivity, where outputs and single or selected inputs are considered. Since construction is a labor-intensive industry, it can be argued that manpower is the dominant productive resource, thus construction productivity is mainly dependent on human effort and performance (Jarkas, 2010).

Labour Productivity

Construction labour productivity has been the subject of numerous studies (Durdyev, 2014; Rivas et al., 2011; Dai et al., 2009; Abdul Kadir et al., 2005). Productivity improvement begins with identification of impact factors (Enshassi et al., 2007), such as, material shortage, low level of project leadership skills, escalation of material prices, unavailability of highly experienced workforce and poor quality of equipment. These can then be tackled in order to improve scheduling, eliminate wasteful costs and enhance predictability of productivity levels during buildup of construction costs (Rivas et al., 2011). Bekr (2016) opined that construction productivity can be defined in many ways, and is usually equated with labour productivity, which can be expressed as units of work placed or produced per man-hour, or inversely, man-hours per unit.

Factors Affecting Productivity

A comprehensive but by no means exhaustive summary of some of the recent research works in the field of productivity is provided in Table 1. Researchers have unearthed various factors at different periods of time in different locations. For example, Fagbenle, Ogunde, and Owolabi, (2011) discovered that lack of materials, incomplete drawings, incompetent supervisors, lack of tools and equipment, absenteeism, poor communication, instruction time, poor site layout, inspection delay and rework were the ten most significant problems affecting construction productivity in Nigeria.

Table 1: Some recent research works on factors affecting productivity in construction projects

S/No	Author(s)	Research highlights
1	Agarwal Agrawal, and Pandey, (2016)	Applied AHP process to identify ten management related factors that affect labour productivity.
2	Fagbenle, Makinde, Afolabi, and Fagbenle, (2016)	Inadequate/Lack of Tools and Equipment; Rework; Material Shortage; Inclement Weather; Interference as the top five clogs impeding craftsmen productivity in Nigeria.
3	Atomen, Chuka, Emeka, and Samuel, (2015)	Most important issues contributing to labor productivity are the involvement of non-professionals and material shortages at construction sites.
4	El-Gohary and Aziz, (2013)	Classified 30 productivity factors under three primary categories.
5	Mahamid and Al-Ghonamy, (2013)	identified five important groups of factors negatively affecting labor productivity in public construction projects
6	Jarkas and Bitar (2012)	identified 45 factors, which have significant impact on construction labor productivity in Kuwait

7	Durdyev and Mbachu, (2011)	Identified 56 variables that affect construction productivity, categorized into internal and external groups.
8	Fagbenle, Ogunde, and Owolabi, (2011)	Identified ten most significant problems affecting construction productivity in Nigeria.
9	Jang, Kim, Kim, and Kim, (2011)	Identified and grouped 25 variables into 4 factor-groups.
10	Soekiman, Pribadi, Soemardi, and Wirahaddikusmumah, (2011)	Identified 113 variables affecting construction labor productivity; created 15 groups of factors with similar characteristics.

Source: Researcher's Compilation (2017)

Motivation in the Construction Industry

Motivation is the art of inducing behaviour in a particular manner in order to achieve a task (Adeel, 2015). Motivated behaviour has three basic characteristics: (i) It is sustained for a long time until satisfied; (ii) It is goal-directed with a specific objective; and (iii) It results from a need felt by the worker. Several theories have been propounded to help to understand the human being and how to handle him to get goals achieved such as Content theories and Process Theories of Motivation. The Content Theories of Motivation attempt to identify the specific needs that can be leveraged to actually motivate workers (Mullin, 2005). Well-known examples of content theories of motivation include the following: (i) Maslow's Hierarchy of Needs; (ii) Herzberg's Motivation-Hygiene Theory; (iii) McGregor's Theory of X and Y; and (iv) David McClelland's Achievement Motivation Theory. Process Theories of motivation on the other hand are concerned with how people perceive their working environment, including the ways in which they interpret and understand behaviour; they are thus extrinsic theories (Mullins, 2005). The well-known process theories are: (i) Expectancy theory, (ii) Goal theory, (iii) Equity theory, and (iv) Reinforcement theory.

Motivation can be classified into two categories. These are non-financial and financial incentives schemes. Non-financial motivation is intangible; it includes advancement, the work itself, responsibility, and recognition, relations with co-workers, company policy and working institutions. According to Cole (1997), incentive schemes include extra payments or increase in salaries, fringe benefits covering such items as, car, sickness benefits, free education for managers' children, and free holidays. There are several types of non-financial incentives that may be applied to motivate workers, including Job Security, Provision of personal protective equipment, Opportunity to observe national holidays, Free transportation, and Opportunity to learn new skills or techniques.

Most of the researches cited in this paper have been carried out in large construction firms. Few or none of the studies have employed Abuja as their study area. Although Kuroshi and Lawal (2014) appraised internal factors that affect labour productivity in medium sized construction firms in Nigeria, their study was located in the southern part of Nigeria. To the best of the researcher's knowledge, the effect of motivational strategies on labour output in small and medium sized enterprises in Abuja has not received much research attention. This represents a gap in knowledge, which this paper attempted to fill.

RESEARCH METHODOLOGY

The research design for this study was empirical in nature, being concerned with assessing the perceived effect of motivational strategies on the productivity of construction professionals and project operatives. In doing this, the study covered building construction projects only in Abuja, the Federal Capital Territory of Nigeria. The study also covered a period commencing from the fourth quarter of 2016 to the second quarter of 2017.

The population for this research comprised the construction professionals and operatives i.e. architects, quantity surveyors, builders and artisans of firms registered with Federation of Construction Industry (FOCI, Nigeria). The population of such construction firms was 84, of which 55 firms were adjudged to be Small and Medium-sized Enterprises (SMEs). Using snowballing technique a convenience sample of 48 firms was obtained, from the 55 questionnaires that were prepared.

The instruments for data collection included checklists for recording information and well structured questionnaires that utilized closed-ended type of responses, with respondents indicating their level of agreement on a five-point Likert scale. The analysis of the collected data was carried out using percentile to determine the frequency of use and level of satisfaction of firms with the use of the identified motivational strategies. Correlation analysis was employed to determine the relationship between the motivation strategies and the output of the selected tradesmen (i.e. brick laying, block laying, concreting, plastering, painting and tiling). Independent Sample T-test was used to determine difference existing between the motivational strategies adopted by construction SMEs, based on the small sample size and the fact that only two variables were being tested.

RESULTS AND DISCUSSIONS

Financial and Non-financial Motivational Strategies Applied In Construction SMEs

The top five financial motivational strategies that were applied in SMEs were (i) transportation, (ii) bonuses, (iii) pay allowance, (iv) health insurance and (v) life insurance. These were provided for in the umbrella agreement between employers and employee trade unions in the construction industry, which was known as the NJIC agreement on remuneration (National Joint Industrial Council). It was observed that just over half of the sampled firms applied any of the strategies being examined. In fact the most frequently applied financial strategy (transportation) was applied in only 58% of the firms. Comparatively, the top five non-financial motivational strategies that were applied in SMEs were (i) Emergency loan/IOU, (ii) Provision of personal protective equipment, (iii) Opportunity to observe national holidays, (iv) Job Security and (v) Flexible work hours. These non-financial motivation strategies were applied in only 28 out of the 48 firms sampled.

Motivational Strategies in Construction SMEs and Labour Productivity

Financial motivation strategies were significantly associated with labour output only in the case of bricklayers and blocklayers. In the case of these two trades, a positive and significant correlation was observed, indicating that increase in the number of financial motivation strategies applied will result in an increase in the output of bricklayers and blocklayers. Observed coefficients of determination (R^2) were 59% and 41% respectively. All of the other four trades that were examined (concretors, plasterers, painters and tilers) had negative and non-significant association with number of financial motivation strategies applied. These results were presented in Table 2.

Table 2: Results of Correlation Analysis on Financial Motivation and Labour Productivity

Analysis No.	Trades	r	P	Remark
1	Brick laying	0.767	0.000	Significant; strong correlation
2	Block laying	0.640	0.001	Significant; strong correlation
3	Concreting	-0.001	0.995	Non-significant; very weak correlation
4	Painting	-0.187	0.382	Non-significant; very weak correlation
5	Plastering	-0.098	0.650	Non-significant; very weak correlation
6	Tiling	-0.120	0.578	Non-significant; very weak correlation

Source: Researcher's Analysis of Data (2017)

Notes: Variables tested were X1 = Number of financial motivation strategies applied in SME; X2 = Output achieved by particular labour trade being examined; r = coefficient of correlation; P = probability value.

Table 3: Results of Correlation Analysis on Non-financial Motivation and Labour Productivity

Analysis No.	Trade	r	P	Remark
7	Brick laying	-0.102	0.637	Non-significant; very weak correlation
8	Block laying	-0.154	0.474	Non-significant; very weak correlation
9	Concreting	-0.314	0.136	Non-significant; slightly weak correlation
10	Painting	-0.278	0.189	Non-significant; very weak correlation
11	Plastering	-0.134	0.532	Non-significant; very weak correlation
12	Tiling	0.432	0.035	Significant; fairly strong correlation

Source: Researcher's Analysis of Data (2017)

Notes: Variables tested were X1 = Number of non-financial motivation strategies applied in SME; X2 = Output achieved by particular labour trade being examined; r = coefficient of correlation; P = probability value.

In the case of non-financial motivation, it was observed that only the output of tilers was significantly associated with the number of non-financial motivation strategies applied in SMEs. A weak coefficient of determination (R^2) of 19% was obtained. The outputs of the other five trades that were examined (bricklayers, blocklayers, concretors, plasterers and painters) had negative and non-significant association with number of non-financial motivation strategies applied. These results were presented in Table 3.

Difference between Monetary Values of Motivational Strategies

No significant differences were discovered in the monetary values of the financial and non-financial motivation applied in SMEs. This was true for all of the six trades that were examined (bricklayers, blocklayers, concretors, plasterers, painters and tilers). The observed calculated value of the 't' statistic was consistently less than the critical value of $t_{0.05}$; in addition, the probability that the observed value of the 't' statistic was entirely due to chance was greater than the acceptable threshold of 0.05. The results of the T – Test is summarised in the Table 4:

Table 4: Results of T-test analyses on

Analysis No.	Labour Trades	Mean Values	T_{cal}	T_{tab}	P_{value}	Remark
1	Brick Layers	$X_1 = 42.1250$; $X_2 = 47.7917$	-0.299	2.01	0.766	NSD
2	Block Layers	$X_1 = 29.1250$; $X_2 = 34.6250$	-0.600	2.01	0.552	NSD
3	Concretors	$X_1 = 29.4375$; $X_2 = 17.4792$	1.645	2.01	0.107	NSD
4	Plasterers	$X_1 = 29.2917$; $X_2 = 33.1250$	-0.671	2.01	0.505	NSD
5	Painters	$X_1 = 91.1667$; $X_2 = 143.5417$	-0.598	2.01	0.553	NSD
6	Tilers	$X_1 = 36.7500$; $X_2 = 32.5000$	0.652	2.01	0.518	NSD

Source: Researcher's Analysis of Data (2017)

Notes: Variables tested: X1 = Monetary values of financial motivation strategies applied in SME; X2 = Monetary values of non-financial motivation strategies applied in SME; T_{cal} = value of t-statistic computed from data analysis; T_{tab} = critical value of t0.05; NSD = Non-significant difference.

CONCLUSION AND RECOMMENDATIONS

The results of the analysis of data carried out for the study on the effect of motivation strategies on labour output of small and medium construction firms in Nigeria led to the conclusion that the most frequently used financial motivation strategies are: Transportation, Bonuses, Other allowance, Health insurance and Life insurance. On the other hand the most frequently applied non-financial motivation strategies are: Emergency loan/IOU, Provision of Personal Protective Equipments (PPE), Opportunity to observe national holidays, Provision of residential accommodation and Free transport. However, less than 60% of the sampled firms applied these strategies.

It was also concluded that the number of financial motivation strategies applied in SMEs has significant influence on the output of bricklayers and blocklayers. This was however not true of concretors, plasterers, painters and tilers. Conversely, the number of non-financial motivation strategies significantly influenced only the output of tilers. There was no significant difference in the monetary values of financial and non-financial motivation strategies applied in SMEs for all of the six trades considered in this study.

The following recommendations were made based on the findings of this study:

i. The Nigerian construction industry needs more research into why up to 40% of SMEs in the industry do not apply any labour motivation strategies.

ii. The types and numbers of motivation strategies that had significant impact on productivity in brick and block laying should be adopted for the concreting, plastering, painting and tiling trades as well.

iii. SMEs in the construction industry could focus on the use of financial motivation strategies, since these have been found to positively influence output in two trades. In addition, no significant difference was discovered between the monetary values of financial and non-financial motivation strategies applied in SMEs.

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EVALUATING THE CURRENT TEACHING TECHNIQUES TO THE NIGERIAN UNDERGRADUATE QUANTITY SURVEYING STUDENTS

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The research evaluated the current teaching techniques to the Nigerian undergraduate quantity surveying students with a view to recommending strategies for improving the teaching and learning process. Quantitative data were gathered through questionnaire administered to lecturer and students of the selected Nigerian tertiary institutions, comprising one university, one federal polytechnic and one state polytechnic, using the stratified random sampling techniques. A total of 250 structured questionnaires were administered to students and 15 lecturers, from which totals of 172 were retrieved from students and 14 from the lecturers. These represent response rates of 68.8% for students and 93.33% for lecturers respectively. The collected data were analysed using Mean Item Score (MIS) and ranking method. The research found that the current teaching methods in teaching quantity surveying undergraduate students were: traditional manual measurement of quantities from drawings provided; traditional lectures supplemented by tutorials; traditional measurement practice/procedures; active approach that encourages students' brainstorming/thinking activities and practical problem-solving methods. It was also found that the strategies for improving teaching and learning processes for teaching students were: provision of adequate computer laboratories and give students ample opportunities to explore; adequate classrooms equipment with facilities required to integrate software teaching techniques; provision of workshops for lecturers to understand the process and effective strategies for software integration into teaching. Based on these findings, it can be concluded that traditional teaching technique involving traditional practice and procedures via lectures and lecture materials is still the current teaching method adopted by the institutions. It is recommended that fully embracing software teaching technique while retaining the traditional teaching technique is a major strategy for improving the teaching and learning process for undergraduate quantity surveying students.

Keywords: *undergraduate students, teaching techniques, traditional methods, quantity surveying*

INTRODUCTION

The quantity surveying profession has been known from time past in providing financial know-how to the construction industry for over two centuries. For instance, the existence of a quantity surveying firm has its earliest records to be in Reading as far back to 1785, and the first standard measurement method started in Scotland in 1802 (Aston, 2007). Prior to 1990, the practice of measurements by the Quantity Surveyors (QS) was done manually using dimension sheets, which were completed and transferred into Bill of Quantities format by the use of type-writers and word processors (Cartlidge, 2006; McDonnell, 2010). This practice was largely limited to history with the onset of computerized measurement from the early 1990's onwards, computerized softwares, such as Build-soft, allowed quantity dimensions to be entered directly into computerized programs, which calculated and produced an instant formatted ready to print document (McDonnell, 2010).

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Saidu, et al., (2018). **EVALUATING THE CURRENT TEACHING TECHNIQUES TO THE NIGERIAN UNDERGRADUATE QUANTITY SURVEYING STUDENTS.** Contemporary Issues and Sustainable Practices in the Built Environment. School of Environmental Technology Conference, SETIC, 2018

The conventional approach in teaching quantity surveying-measurement courses involves the lecturer trying to explain the construction technology with drawings, the set of standard rules of measurement and showing students the measurement (taking off) process to quantify the work. Little technology is adopted to teach (McDonnell, 2010). However, this measurement-teaching method was acknowledged as a challenge by Hodgson *et al.* (2008) and Hasan and Rashid (2005). Thus, the current measurement-teaching methods according to McDonnell (2010) may include the software teaching methods and traditional lectures accompanied by tutorials, where students are divided into unit groups.

Over the last five years according to Hodgson (2010), there have been further developments with the introduction of modeling softwares, such as the Building Information Modeling (BIM), where drawings are uploaded and related quantities extrapolated from the model. Thus, the teaching method favoured by lecturers on quantity surveying measurement is the traditional manual measurement techniques, which some argue contradicts work place practices (Hodgson, 2010).

The recent demanding change in the quantity surveying profession on service delivery within tedious deadlines, such as the introduction of fast track procurement, necessity for faster bill of quantities production, cost planning, value management, risk management, and so forth, has been possible to adapt and meet up with most of these changes due to the information technology advancement in the profession (Cartlidge, 2006). Hence the Quantity Surveyors have been greatly impacted by the substantial speed in IT revolution (Cartlidge, 2006). Thus, majority of the industry practicing QSs are fulfilling the measurement function via means of advanced computer Softwares, such as Build-soft, CIT, Cato, Master bill and so forth (McDonnell, 2010).

However, there is apprehension within the quantity surveying profession that measurement standards have decreased over the last decades. Earl (2009) suggests that if QSs do not outline and implement professional measurement standards, other specialists may take over the profession. This problem according to Hodgson *et al.* (2008) has been linked to the teaching methods adopted in training the quantity surveying courses at school undergraduate levels. Also, the dangers related with too much focus being placed on only computer softwares were seen by Biggs (2003) and McDonnell (2010) who strongly debate the opinion of introducing ICT softwares as a parallel learning tool to the traditional (conventional) technique as against the opposing view of using only software in teaching measurement as practiced in other professional courses such as computer aided design in teaching draughting. Therefore, the traditional teaching methods have resulted in a disparity between what is taught to students and what the industry needs (Hodgson, 2010), and this leaves an argument open as to what is the application of software over traditional teaching techniques hold in the delivery and learning of relevant quantity surveying skills?

Previous research in this area focused on computerization of measurement skills (McDonnell, 2010); e-learning approach to quantity surveying measurement (Hodgson *et al.*, 2008); impact of information communication technology on teaching and learning (Bindu, 2016); and suggestion of new tool for measurement (Earl, 2009). Most of the research are foreign based and little or no study of this nature have been conducted in Nigeria as regards quantity surveying undergraduate studies in Nigerian tertiary institutions. Thus, Oladapo (2006) and Aiyetan, (2015) recommend study of this nature be conducted periodically, in order to determine whether radical revisions are necessary for improvement. Hence, this research evaluates the current teaching methods to the Nigerian undergraduate Quantity Surveying students with a view to recommending strategies for improving the teaching and learning process in the field of quantity surveying. The specific objectives include: to assess students' and lecturers' perception on the current teaching methods; and to recommend the best strategies for improving teaching methods and learning process to undergraduate quantity surveying students.

Current Quantity Surveying Teaching Methods

The developmental changes in the role of Quantity Surveyors according to Hodgson (2010) has not been completely integrated into undergraduate teaching elements. The teaching method generally favoured by lecturers involves traditional manual measurement techniques, which some may argue contradicts current work practices.

According to McDonnell (2010), the existing teaching method quantity surveying students are being taught measurement courses involves traditional lectures accompanied by tutorials,

where students are divided into unit groups. The tutorial provides the students a chance to practice new knowledge acquired during lectures, giving students a perception of practice in work place.

The traditional teaching method is enshrined in the traditional measurement practice which involves a comprehensive building construction knowledge; familiarity with the standard rules of measurement; knowledge of the customs of each trade; tact; endurance; creativity; accurateness; vitality; reasonableness; and ability to visualize design details, in order to be able to understand production drawings, calculate, quantify and document the quantified work, being acquainted with the rules of measurement (Hasan and Rashid, 2005 and Hodgson *et al.* 2008).

Although, McDonnell (2010) supports the application of computerized softwares as a learning tool; but felt that it should be embraced parallel to traditional approach. However there is a contrary view which involves the application of only software technique in teaching as seen in teaching practices on some sister profession.

Strategies for Improving Teaching Methods to Undergraduate QS Students

Some of the strategies to improve teaching and learning process according to Kumar and Kumaresan (2007) are highlighted as follows: provision of adequate computer laboratories and opportunities for students to explore; use of softwares to be encouraged; adequate equipment of lecture rooms with facilities to support software teaching; initiation of successive lecturer-training programmes to creates software awareness; re-design of courses to encourage the application of software and also make time available for its use; and adequate time allowance for students to learn the language and features of software packages before use.

Goktas and Yildirim (2009) noted that technology-enhanced softwares should augment course syllabus. Ertmer and Otternbreit-Leftwich (2010) added that partnerships support encourages effective experience and practice sharing. Almekhlafi and Almeqdadi (2010) emphasised on the provision of workshops for lecturers to understand the process and effective strategies for software integration into teaching. Al-Bataineh *et al*. (2008) suggested the provision of development and technology training to improve lecturers' skills. To conclude, Lim (2007) suggested the encouragement of optimistic conducts for the integration of ICT into teaching and learning.

RESEARCH METHOD

A survey design approach was employed in this research with quantitative data gathered from the respondents.The research population constituted the quantity surveying teaching tertiary institutions in Niger state. The sample frame comprised: Federal University of Technology Minna, Federal Polytechnic Bida, and Niger State Polytechnic Zungeru.

The research only focused on 200 Level, 300level and 500 level students of the Federal University of Technology, Minna. Only ND2 and HND2 students of the Federal Polytechnic Bida were considered in this research. Also, since the QS programme of the Niger State polytechnic, Zungeru ends at ND level, only ND2 student were considered. The first year students of the 3 institutions were not considered, because the first year students are considered to be fresh and mostly taking general courses of their institutions. The 400 level students were also not considered, because they were on Industrial Training attachment (IT) as at the period of this research.

These institutions were selected, because they are the only three quantity surveying teaching institutions in Niger State. Niger state as a geographical area was selected, because of its proximity with Abuja which has fewer quantity surveying teaching institutions.

In order to guarantee equal representation for each of the identified groups/strata in the population, stratified random sampling method was adopted. The respondents were first categorised into different strata before they were selected and randomly sampled accordingly.

A total of three hundred (300) students and fifteen (15) lecturers were identified from the sample frame. The numbers were subjected to Krejcie and Morgan formula. The formula revealed that the minimum numbers to be drawn from the sample are 169 students and 14

lecturers respectively, at 5% limit of error and at 95% confidence level. The formula is given as:

$$S = X2\ N\ P\ (1 - P) \div d2\ (N - 1) + X2\ P\ (1 - P)$$

Where S = required sample size; X^2 = the table value of chi-square for 1 degree of freedom at the desired confidence level (3.84); N = Population size; P = Population proportion; d = Degree of accuracy.

Table 1.0 shows that a total of 250 structured questionnaires were administered to students and 15 lecturers, from which totals of 172 were retrieved from students and 14 from the lecturers, with all fully answered and valid for analysis. This represents response rates of 68.8% for students and 93.33% for lecturers respectively. The questionnaires are designed on a five-point Likert scale as: 5-very, 4-high, 3-high, 3-moderate, 2-low and 1-very low.

Table 1.0: Demographic distribution of respondents

Respondents	Population Size		Questionnaires administered		Questionnaires retrieved and valid for analysis		Percentage response rates	
	Students	Lecturers	Students	Lecturers	Students	Lecturers	Students	Lecturers
FUT Minna	156	05	113	05	89	05	35.6%	33.33%
Federal Polytechnic Bida	93	05	89	05	53	05	21.2%	33.33%
Niger State Polytechnic Zungeru	51	05	48	05	30	04	12%	26.67%
Total	**300**	**15**	**250**	**15**	**172**	**14**	**68.8%**	**93.33%**

Source: Researchers' survey, 2017

The collected data were analysed using descriptive method (Mean Item Score {MIS} and ranking method). Data processing was done with the aid of Statistical Package for the Social Sciences (SPSS) software. MIS was used to determine the weighted mean average of the identified factors and the premise of decision for the ranking is that the factor with the highest MIS is ranked 1st and others in such subsequent descending order.

The decision rule utilized in this research is based on the Morenikeji (2006) cut of point that factors with MIS of between 4.5-5.0 are rated very high; 3.50-4.49 are rated high; 2.50-3.49 are rated as moderate; 1.50-2.49 rated low and 0-1.49 are rated very low.

RESULTS AND DISCUSSION

Current Teaching Methods from Students' Perspective

Table 2.0 shows that the first-seven ranked teaching techniques were rated high by the students in this category, because they fall between MIS of 3.50-4.49. These teaching techniques include: traditional manual measurement of quantities from drawings provided was ranked first with MIS of 4.22; traditional measurement practice/procedures was ranked second with an MIS of 4.20; interactive approach that encourages association and cooperation among students was ranked third with MIS of 4.03; active approach that encourages students' brainstorming/thinking activities was ranked fourth with MIS of 3.85; sensing, visual and hands-on demonstrations with MIS of 3.74; traditional lectures supplemented by tutorials was ranked sixth with MIS of 3.66; and clear illustrations of natural/practical and identifiable/real lifetime situations was ranked seventh with MIS of 3.63

However, the least ranked teaching methods include: software-assisted method ranked eleventh with MIS of 2.9; and more theory without much practical and real life situations ranked the twelfth with MIS of 2.88.

Table 2.0: Current teaching method (students' perspective)

S/n	Teaching methods	Total	MIS	Rank
1	Traditional manual measurement of quantities from drawings provided	172	4.22	1
2	Traditional measurement practice/procedures	172	4.20	2
3	Interactive approach that encourages association and cooperation among students	172	4.03	3

4	Active approach that encourages students' brainstorming/thinking activities	172	3.85	4
5	Sensing, visual and hands-on demonstrations	172	3.74	5
6	Traditional lectures supplemented by tutorials	172	3.66	6
7	Clear illustrations of natural/practical and identifiable/real lifetime situations	172	3.63	7
8	Practical problem-solving methods with material that emphasizes fundamental understanding	172	3.60	8
9	Measurements of quantities from Drawings electronically uploaded to produce printable bill	172	3.19	9
10	Adequate wide spectrum of computerized software packages	172	3.10	10
11	Software-assisted method	172	2.91	11
12	More theory without much practical and real life situations	172	2.88	12

Source: Researcher's analysis, 2017

Current Teaching Methods from Lecturers' Perspective

Table 3.0 shows that the lecturers' views are quite similar to those of the students. The first seven ranked teaching techniques are rated high because they fall between the MIS of 3.5-4.49. The first three ranked were: traditional manual measurement of quantities from drawings provided (4.43); interactive approach that encourages association and cooperation among students (4.14); and traditional lectures supplemented by tutorials (4.00); active approach that encourages students' brainstorming/thinking activities respectively (3.93); and practical problem-solving methods with material that emphasizes fundamental understanding (3.86).

The three least ranked techniques were: adequate wide spectrum of computerized software packages; measurements of quantities from drawings electronically uploaded to produce printable bill; and more theory without much practical and real life situations with MIS of 3.07, 3.00 and 2.36 respectively.

Table 3.0: Current teaching method (lecturers' perspective)

Sn	Teaching Methods	Total	MIS	Rank
1	Traditional manual measurement of quantities from drawings provided	14	4.43	1
2	Interactive approach that encourages association and cooperation among Students	14	4.14	2
3	Traditional lectures supplemented by tutorials	14	4.00	3
4	Active approach that encourages students' brainstorming/thinking activities	14	3.93	4
5	Practical problem-solving methods with material that emphasizes fundamental understanding	14	3.86	5
6	Clear illustrations of natural/practical and identifiable/real lifetime situations	14	3.64	6
7	Sensing, visual and hands-on demonstrations	14	3.57	7
8	Software-assisted method	14	3.43	8
9	Adequate wide spectrum of computerized software packages	14	3.07	9
10	Measurements of quantities from Drawings electronically uploaded to produce printable bill	14	3.00	10
11	More theory without much practical and real life situations	14	2.36	11

Source: Researcher's analysis, 2017

Strategies for Improving Teaching and Learning Process from Students' Perspective

Table 4.0 shows that from the decision rule, all the 16 strategies considered in this research were deemed very high and high by the respondents, because they fall between MIS of 4.63-3.50

The first three ranked recommended strategies were: colleges should have adequate computer laboratories and give students enough opportunities to explore. This is ranked first and rated very high with a mean score of 4.63; adequate classrooms equipment with facilities required to integrate software teaching technique was ranked second and rated high with MIS of 4.37; provision of workshops for lecturers to understand the process and effective strategies for software integration into teaching was ranked third and rated high with MIS of 4.35.

The three lowest ranked strategies, though rated high were: adequate time allowance should be given students to learn the language and features of software packages before using it (3.88); teaching of traditional manual quantification should be retained (3.85) and traditional manual quantification should be ignored in light of systemic changes in the industry (3.50).

Table 4.0: Strategies for improving teaching and learning process (students' perspective)

Sn	Improvement strategies	Total	MIS	Rank
1	Colleges should have adequate computer laboratories and give students enough opportunities to explore	172	4.63	1
2	Adequate classrooms equipment with facilities required to integrate Software teaching technique	172	4.37	2
3	Provision of workshops for lecturers to understand the process and effective strategies for software integration into teaching	172	4.35	3
4	Development and use of QS software may be initiated and encouraged	172	4.27	4
5	Courses may be redesigned to encourage the use of softwares	172	4.17	5
6	Provision of adequate technical support by institution	172	4.13	6
7	Partnership supports that help share experiences and practices of software technology among lecturers	172	4.12	7
8	Adequate management of class size	172	4.09	8
9	Organisation of successive lecturer-training programme.	172	4.08	9
10	Innovative teaching modules should be prepared	172	4.07	10
11	Provision of effective and continuous professional development technology training to improve lecturers' skills	172	4.05	11
12	Course curriculum may be redesigned to provide time for the use of softwares	172	4.02	12
13	More focus should be placed on computerised softwares	172	3.93	13
14	Adequate time allowance should be given students to learn the language and features of software packages before using it	171	3.88	14
15	Teaching of traditional manual quantification should be retained	172	3.85	15
16	Traditional manual quantification should be ignored in light of systemic changes in industry	172	3.50	16

Source: Researcher's analysis, 2017

Strategies for Improving Teaching and Learning Process from Lecturers' Perspective

Table 5.0 shows that the first five strategies were deemed very high by the respondents, because they fall between MIS of 4.5-5.00. The remaining were rated high, though, the last strategy by the respondents in this category was rated moderate.

The strategies that were rated very high were: provision of adequate technical support by institution which was ranked first (4.64); adequate classrooms equipment with facilities required to integrate software teaching technique ranked second (4.57); adequate management of class size (4.50); provision of effective and continuous professional development technology training to improve lecturers' skills (4.50); and colleges should have adequate computer laboratories and give students enough opportunities to explore (4.50), were all ranked third because they all recorded MIS of 4.50.

However, the least ranked strategy was; traditional manual quantification should be ignored in light of systemic changes in industry with MIS of 3.21.

Table 5.0: Strategies for improving teaching and learning process (lecturers' perspective)

Improvement strategies	Total	MIS	Rank
Provision of adequate technical support by institution	14	4.64	1
Adequate classrooms equipment with facilities required to integrate Software teaching technique	14	4.57	2
Adequate management of class size	14	4.50	3
Provision of effective and continuous professional development technology training to improve lecturers' skills	14	4.50	3
Colleges should have adequate computer laboratories and give students enough opportunities to explore	14	4.50	3

Course curriculum may be redesigned to provide time for the use of softwares	14	4.43	6
Partnership supports that help share experiences and practices of software technology among lecturers	14	4.36	7
Courses may be redesigned to encourage the use of softwares	14	4.29	8
Teaching of traditional manual quantification should be retained	14	4.29	8
Innovative teaching modules should be prepared	14	4.29	8
Organisation of successive lecturer-training programme.	14	4.29	8
Development and use of QS software may be initiated and encouraged	14	4.29	8
Provision of workshops for lecturers to understand the process and effective strategies for software integration into teaching	14	4.00	13
More focus should be placed on computerised softwares	14	3.93	14
Adequate time allowance should be given students to learn the language and features of software packages before using it.	14	3.86	15
Traditional manual quantification be ignored in light of systemic industrial changes	14	3.21	16

Source: Researchers' analysis, 2017

It is clear from Table 2.0 and 3.0 (students and lecturers views) that the current teaching methods used in teaching quantity surveying undergraduate students were: (a) traditional manual measurement of quantities from drawings provided; (b) traditional lectures supplemented by tutorials; (c) traditional measurement practice/procedures; (d) active approach that encourages students' brainstorming/thinking activities and practical problem-solving methods with material that emphasizes fundamental understanding; (e) interactive approach that encourages association and cooperation among students; (f) sensing, visual and hands-on demonstrations; and (g) clear illustrations of natural/practical and identifiable/real lifetime situations

These results corroborate the findings of findings of McDonnell (2010) who stated that the teaching method of undergraduate quantity surveying courses and connecting to measurement retains traditional manual measurement. The results also support the findings of Hasan and Rashid (2005) and Hodgson *et al.* (2008) as stated in section 2 of this research.

It can be understood from Table 4.0 and 5.0 that the strategies for improving teaching and learning processes for teaching the QS undergraduate students as recommended by the both the students and lecturers were: (a) colleges should have adequate computer laboratories and give students enough opportunities to explore; (b) adequate classrooms equipment with facilities required to integrate software teaching techniques; (c) provision of workshops for lecturers to understand the process and effective strategies for software integration into teaching; (d) provision of adequate technical support by institution; (e) adequate management of class size; (f) provision of effective and continuous professional development technology training to improve lecturers' skills; and (g) institutions should have adequate computer laboratories and give students enough opportunities to explore. These results collaborate with the findings of Yildirim (2007), and Liu and Szabo (2009) who emphasized the provision of technical support; Kumar and Kumaresan (2007) highlighted the provision of adequate lecture room facilities, provision of adequate computer laboratories and opportunities for students to explore; and Hutchison and Reinking (2011), and Al-Bataineh *et al*. (2008) who both highlighted the provision of technology training programmes to update lecturers' skills as improvement strategies to teaching and learning process.

However, the traditional manual quantification being ignored in light of systemic changes in industry was the least ranked among the strategies (poorly recommended). This result agrees with the findings of McDonnell (2010) who found that despite the rise of computerization in quantity surveying teaching and learning process, there is little support for the elimination of teaching traditional manual quantification.

CONCLUSION AND RECOMMENDATIONS

The research evaluates the current teaching methods to the Nigerian Quantity Surveying undergraduate students with a view to recommending strategies for improving the teaching and learning process in the field of quantity surveying. The specific objectives include: to assess students' and lecturers' perception on the current teaching method; and to recommend

the best strategies for improving teaching methods and learning process to undergraduate quantity surveying students.

The research concludes that traditional teaching technique which involving traditional practice or procedures via lectures and lecture materials (lecture notes) is the current teaching method in teaching the QS undergraduate students. The research also concludes that the effective strategies for improving teaching and learning process are: provision of software packages and adequate technical support by institution; adequate class size management; provision of adequate classroom facilities to aid software teaching; organisation of training programmes to equip lecturers' skills; and provision of adequate computer laboratories and availability of enough opportunities for students to explore with sufficient power supply.

The following recommendations were put forward in this research as proposed remedy to the challenges faced in teaching quantity surveying undergraduate students:

Recommendations to Quantity Surveying Teaching Institutions

1. provision of adequate computer laboratories and allow students opportunities to explore;
2. provision of quantity surveying softwares and adequate technical support by various institutions of learning;
3. Quantity surveying softwares should be fully incorporated into the undergraduate education curriculum;
4. Adequate power supply and well equipped classroom facilities should be provided and improved where available;
5. Students should be exposed to vast/practical knowledge and what is obtainable in practice;
6. Provision of effective and continuous development and technology training to improve lecturers' skills and knowledge;
7. Management of class size should be ensured by various institutions; and
8. Both the traditional and software teaching technique should be used in the education process of undergraduate quantity surveying students.

Recommendations to the QS Professional Bodies (NIQS and QSRBN)

The quantity surveying National bodies (QSRBN and NIQS) should champion the campaign for planning, regulating and implementing a world class standard educational framework including effective teaching strategies such as softwares knowledge, adequate teaching and learning facilities for outstanding performance and relevance in the construction industry and the world at large.

General Recommendation

Fully embracing software teaching technique while retaining the traditional teaching technique is a major strategy for improving the teaching and learning process for undergraduate quantity surveying students, as it provides the basic knowledge and guarantees graduates that are conversant with the latest technology. Hence the software teaching technique should be fully embraced while retaining the traditional teaching technique.

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ASSESSMENT OF LABOUR PRODUCTIVITY AND CONSTRUCTION WORKERS WAGES ON ACTIVE SITES IN MINNA

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One of the most challenging issues in the construction industry is how to improve the production efficiency. Many research have been done in the past, however, a deeper understanding is still needed to improve the labour productivity as it is very important, especially in developing countries, where most of the building construction works are majorly done on manual basis. Hence, research on the improvement of labour productivity becomes important. In view of this, the relationship between labour productivity and workers' wages was assessed on various active construction sites in Minna, with a view to achieving sustainable growth and development in the industry. Questionnaires were administered to construction professionals to sample their opinion on the mode of workers payment on site, the factors affecting workers' wages and measurement of production output of masons on plastering works. Time study form was also designed to record the elements of the task performed and the time taken to complete each work over a period of observation. The obtained data were analysed using Mean Item Score, Bar chart, and T-test. The research findings show that respondents' ranked time based and task based means of firms' payment as the same, but ranked the mode of payment preferred by workers, as been predominantly the piece rate basis of payment as the most preferred by workers. The average output for plastering work for the Nigeria Security Civil Defense Corps (NSCDC) site was 26.60m2 per day while that of the National Ministry of Power Works and Housing (NMPWH) was 20.60m2. Thus it's concluded that the relationship between workers' wages and productivity can be summarized that productivity is directly linked to workers' wages, and workers' wages is in turn dependent on productivity. Hence it is therefore recommended that the piece rate of job allocation be adopted by construction professionals to get the best of their workers.

Keywords: Construction industry, productivity and Workers' wages.

INTRODUCTION

The construction industry generally plays a vital role in a national economy due to the usage of its products which includes; buildings, roads and dams for the production of goods and services. An enhanced productivity has a positive effect on the Gross Domestic Product (GDP) of every nation. Despite the immense size and significance of the construction industry to the economies of most nations, its productivity is one of the most controversial and least understood factors in the industry (Haskell, 2004). Productivity is one of the parameters often used to determine the profitability of an average construction worker. It is considered as output of a worker per hour within a specified range of output, which is often rewarded based on the hour the work is carried out. Output of an average worker is relative when considered within the context of other workers; the output could be changed based on individual determination to increase his output based on attached reward. Productivity is also regarded as the measure of effectiveness of a system by utilizing input to produce an output. Therefore, in an output driven organization like the construction industry, it is a major concern and the effective conversion of resources into marketable outputs for profit on investment and its measurement is always a priority (Wahab 2010; Wilcox; Stringfellow; Harris and Martin 2000).

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In conventional wage bargaining models, there is broad consensus that the development of productivity is the primary variable influencing the wage-setting behaviour of unions. At the same time, these kinds of microeconomic theory suggest a policy choice of setting a particular wage, in order to achieve a higher level of productivity, in particular if wage increases remain below the rate of productivity growth (Lehment 2000). Ameh and Odusami (2002) identified low wages, lack of materials and unfriendly working atmosphere as having key impact on productivity of craftsmen involved in in-situ concrete operation in single storey building projects in Nigeria.

According to Benham (1932) a wage may be defined as a sum of money paid under contract by an employer to a worker for services rendered. It s essentially a price for a particular commodity, viz., labour services. Productivity has been an essential contributor to corporate success, because of its direct translation into cost savings and profitability. Productivity has also been a key to long-term growth and sustainable improvement and when associated with economic growth and development generates non-inflationary increases in wages and salaries (Mojahed, 2005).

It was discovered that many of the past studies locally and globally (Zakari *et al*., 1997; Bloisi *et al.,* 2003., Thomas *et al*., 2004; Kadir *et al*., 2005; Ashwort, 1999; and Kazaz and Ulubeyli, 2007; Udegbe, 2005, Kazas *et al.,* 2008; Kaming *et al*., 1997., Mullins, 2005; Harris and McCaffer 2005), concentrated on assessing the factors affecting artisans and their supervisors' productivity with little emphasis on effect of worker's wages on labour productivity. This is an important issue to developing nation, like Nigeria. Hence, this study will be focusing on assessing the labour productivity and construction workers' wages on active construction sites in Minna. The study is aimed at assessing the relationship between productivity of the construction workers wages on active sites, with a view to achieve sustainable growth and development in the industry. These will be achieved by determine the mode of payment of wages on site, examine the factors that affect construction workers wages, determine the productivity on site using different wages and establish the relationship between labour productivity and construction workers wages.

LITERATURE REVIEW

The construction industry is a major indicator and a significant contributor of the economic growth of any nation. For instance, the construction industry in developed countries contributes between 7-10 % to GDP, whereas in under developed countries, the percentage is between 3-6% (Wibibi, 2003). Furthermore, it contributes significantly to a nation's (GDP) which is a measure of the volume of national output and input. The construction industry stands out as the major contributor to capital formation in Nigeria (Aboyade, 1966). In the pre-independence decade, it accounted for about 40% of the total capital formation and little above 50% during the post-independence decade (Umo, 1984). The construction industry is very important to the economy of every nation. This importance stems from a wide range of reasons associated with certain peculiar features of the industry, such as its products being investment-goods (Kazaz and Ulubeyli, 2004). It covers half of the entire field of fixed capital accumulation (Fagbenle, 2009) and therefore; constitutes the most single sector of capital formulation in any national economy (Ayandele, 1996). In Nigeria, construction investments account for over 60% of the Gross Fixed Capital Formation (GFCF), for instance, the total national investment annually (Dlakwa and Culpin, 2010). The construction industry is also seen as the barometer for measuring the performance of the economy in most developing countries (Kazaz and Ulubeyli, 2004; Chitkara, 2006).

Labor productivity can be defined as the amount of work done by craft workers within a certain period of time (Mahamid, 2013. Arditi and Mochtar 2000). Productivity has been given a mathematical expression by Heizer and Render (1999) as follow:

$$\text{Productivity} = \frac{\text{Output}}{\text{Input}}$$

It is obvious from the mathematical expression above that productivity will increase when output increase with input being constant or decreasing input with output constant. Construction productivity carries immense consequences for the national economy as a whole; however, it remains one of the least understood subjects (Haas *et al.*, 1998).

Productivity is one of the most important factors affecting the success and overall performance of every organization, whether large, medium or small, in today's competitive

market (Ersoz, 1999; Sweis *et al*., 2009). According to Nkado (1995) and Walker (1995), construction productivity is traditionally identified as one of the three main critical success factors together with cost and quality for a construction project. However, it has been observed that construction productivity is of great concern in both the construction industry and academia (Park *et al*., 2005). Lawal (2008) reports that construction workers in the Nigerian public service have almost zero productivity. Therefore, poor productivity of craftsmen have been identified as one of the most daunting problems that construction industries especially those in developing countries, face (Kaming *et al*., 1997). In view of this, there is a growing and continuous interest in productivity studies all over the world, because of its importance in the management decision and control of project cost. Motwani *et al*. (1995) opined that identifying and evaluating the factors that influence productivity are critical issues facing construction managers. Enshassi *et al.* (2007) observe that despite the intensive investigations made into the factors affecting labour productivity, researchers have not agreed on a universal set of factors with significant influence on productivity; nor was any agreement reached on the classification of these factors. Labour has been found to account for a third of the total direct capital cost of construction projects (MacTague *et al.*, 2002; Thomas *et al.*, 2003; Akindele, 2004). However, only a third to one a half of workers' time is spent directly on work activities productively (Thomas *et al*, 2003).

According to Benham (1932), Labour in Economics means all kind of work for which a reward is paid. Any type of reward for human exertion whether paid hourly, daily, monthly or yearly and paid in cash, kind, or both is called wages. 'A wage may be defined as a sum of money paid under contract by an employer to a worker for services rendered'. It s essentially a price for a particular commodity, viz., labour services. Wages are given different names, e.g., salaries for the higher staff, pay to the lower staff like clerks and typists, wages for the workers, fees for persons in independent professions like lawyers and doctors, commission for middle men, brokers, etc., and allowance for special work or for special reasons, e.g., travelling allowance, dearness allowance.

From the point of view of payment, wages can be classified as:

i. Time wages, when the wage rate is fixed per hour, per day or per month.

ii. Piece wages, when the worker is paid according to the work done.

iii. Task wages, which is a payment on a contract basis 'payment for finishing a particular job'

From the standard microeconomic theory, wages follow the development of productivity. This link has also been used as a rule for assessing the employment implications of particular wage levels set in collective bargaining, there is broad consensus that the development of productivity is the primary variable influencing the wage-setting behaviour of unions (Lehment 2000).

RESEARCH METHODOLOGY

The term methodology is a system of explicit rules and procedures in which research is based and against which claims of knowledge are evaluated (Ojo, 2003). The data used for this research work were collected in Minna from construction professionals on active construction sites via random sampling; the distribution of questionnaires and the measurement of plastering work to determine the level of each mason's productivity per day were determined. The questionnaires were distributed on active construction site in minna and measurement of plastering work was carried out on two of the sites, the (NSCDC) office complex and the housing unit (NMPWH), in the construction of 2nos of 3bedroom semi-detached bungalows using conventional method, directly located opposite the (NSCDC) office complex, Around People Democracy Party (PDP) secretariat, Minna, Niger State. The reason of observing both sites is to help determine the relationship between wages and productivity as the (NSCDC) plastering work was on task basis while that of (NMPWH) was on time basis. The research work was limited to taking measurement of work done by construction workers' on sites, workers in this context refer to tradesmen such as masons, plumbers and tillers, but the observation was limited to plastering and rendering work, on the construction sites.

Structured questionnaire was self-administered to obtain the mode of payment of construction workers' and the basic factors affecting workers' wages on site. The

questionnaires were administered to construction professionals on active construction sites and a total of 25 questionnaires were administered and 18 were retrieved as at when this paper was prepared. Factors affecting construction workers' wages on site were identified from literature and previous studies. Factors such as productivity, cost of living, demand for labour, complexity of the work, nature of the work among others. Data were collected on a five (5) point weights rating likert's scale, ranging from very high extent (5) to no extent (1), in order to obtain the opinion of construction professionals on the factors affecting workers' wages on site (Morenikeji, 2006). The decision rule is that any factor whose mean falls between 0.5-1.49 is regarded as having no extent, 1.5-2.49 is of low extent, 2.5-3.49 is of moderate extent, 3.5-4.49 is having high extent and 4.5-5.0 is regarded as having very high extent. Factors which have mean score of three (3) and above were considered to have significant effect in determining the workers' wages on construction sites and must be given adequate attention to help make best use of the productivity of the construction workers. Mean item score was used to analyse the perception of construction professionals on the various factors affecting the wages of construction workers in the construction industry. Work measurement is the determination of the time required for an average operative to carry out a particular task in accordance with a specified method and standard of performance (Calvert, 2012). The second sets of data were collected by observing work activity on site. Time study form was design to record the plastering work performed and the time taken for completion over a period of observation. A wrist watch was used to record the time observed for each operation per gang in a working day for plastering and rendering on the construction project observed. The data were collected for five (5) days.

RESULTS AND DISCUSSION

Table 1: Shows that the highest respondents were Bsc/ Btech/B. Eng with a frequency of 8 and a percentage of 44.40%, followed by Msc / Mtech / Meng having a frequency of 7 and a percentage of 38.90%, next to that was Higher National Diploma (HND) with a frequency of 2 and a percentage of 11.10%, while the least were the National Diploma (ND) in building technology who's frequency is 1 and the percentage was 5.60%.

Table 1: Academic qualification

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Msc/Mtech/Meng	7	38.9	38.9	38.9
	Bsc/ Btech/B. Eng	8	44.4	44.4	83.3
	HND	2	11.1	11.1	94.4
	Others	1	5.6	5.6	100.0
	Total	18	100.0	100.0	

Source: Field study, 2017.

Figures 1: Shows that Builder has the highest frequency which is above 6, and next to that is the Architects with frequency of 6, the Quantity Surveyor was next to that, with a frequency above 3 but less than 4 and finally the least respondent in term of professional affiliation were the Engineers (Civil) with frequency of 2.

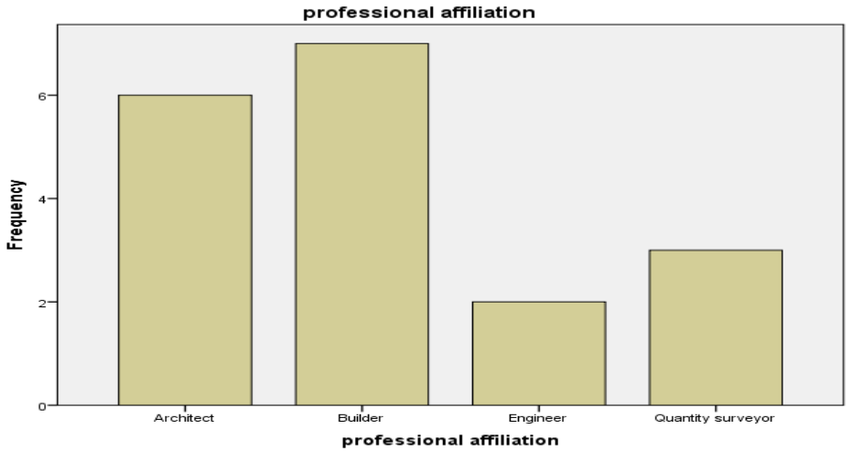

Figure 1: Professional affiliation of the respondents

From table 2: It was observed that the respondents ranked time rate basis and piece rate basis on an equilibrium stand point, as the most adopted mode of payment of workers by various construction firms, as they both have a frequency of 9 and a percentage of 50% each.

Table 2: Mode of payment adopted by the firm

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Time rate basis	9	50.0	50.0	50.0
	Piece rate basis	9	50.0	50.0	100.0
	Total	18	100.0	100.0	

Source: Field study, 2017.

Table 3: Shows that the workers' preferred the piece rate basis to the time rate basis mode of payment. The piece rate basis has a frequency of 15 and percentage of 83.30% while the time rate basis had a frequency of 3 and a percentage of 16.70% respectively.

Table 3: Mode of payment preferred by workers

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Time rate basis	3	16.7	16.7	16.7
	Piece rate basis	15	83.3	83.3	100.0
	Total	18	100.0	100.0	

Source: Field study, 2017.

Table 4: The result of analysis of the factors affecting worker's wages on active construction sites in Minna, Nigeria. Five point Scale of 1, 2, 3, 4 and 5 were assigned to options of no effect, low effect, moderate effect, high effect and very high effect respectively. The decision rule is that any factor whose mean falls between 0.5-1.49, 1.5-2.49, 2.5-3.49, 3.5-4.49 and 4.5-5.0 is regarded as having no effect, low effect, moderate effect, high effect and very high effect respectively. The study showed that the demand of labour have very high effect in determining worker's wages on construction sites, and the following were ranked as having high effect; the capacity of the firm to pay, productivity, nature of the work, labour availability, management attitude and strategy, mode of payment, timeliness of payment, state of the economy, job size and complexity, regularity of employment, cost of living, the skill level available in the labour market, technological development, working hour, local climate condition of the area and nature of the equipment used. While the factors ranked as having moderate effect on the factors that determine workers wages are; desire of the firm to build a good will, working condition, performance review, location of the site, remuneration in comparable firms, job required psychological and social factors, trade union pressure and strategies, and government policies and regulations. Table 4 shows that all the factors affect worker's wages on sites, through; the extent of effect varies

Table 4: Factors that affect construction worker's wage

S/N	Factors	N	Mean Item Score	Std. Deviation	Weights Rating Scale
1	The demand of labour	18	4.7778	.42779	VHE
2	The capacity of the firm to pay	18	4.1111	1.02262	HE
3	Productivity	18	4.1111	.90025	HE
4	Nature of the work	18	4.1111	.67640	HE
5	Labour availability	18	4.0556	1.10997	HE
6	Management attitude and strategy	18	4.0556	.93760	HE
7	Mode of payment	18	3.9444	1.21133	HE
8	Timeliness of payment	18	3.8889	1.13183	HE
9	State of the economy	18	3.8889	1.13183	HE
10	Job size and complexity	18	3.7222	.95828	HE
11	Regularity of employment	18	3.6111	.91644	HE
12	Cost of living	18	3.6111	.69780	HE
13	The skill level available in the labour market	18	3.6111	.69780	HE
14	Technological development	18	3.5556	1.33823	HE
15	Working hour	18	3.5556	1.04162	HE
16	Local climate condition of the area	18	3.5000	1.20049	HE
17	Nature of equipment used	18	3.5000	1.20049	HE
18	Desire of a firm to build their goodwill	18	3.4444	1.42343	ME
19	Working condition	18	3.4444	1.09664	ME
20	Performance review	18	3.3889	.97853	ME
21	Location of the work	18	3.3333	1.23669	ME
22	Remuneration in comparable firms	18	3.2778	1.22741	ME
23	Job required	18	3.1667	1.15045	ME
24	Psychological and social factor	18	3.0556	.87260	ME
25	Trade union pressure and strategies	18	2.9444	1.21133	ME
26	Government policies and regulations	18	2.9444	1.16175	ME
	Valid (N)	18			

N=18, VHE-Very High Effect, H-High Effect, ME-Moderate Effect, LE-Low Effect and NE-No Effect.

Masonry Productivity

The productivity for plastering work in (m2) per day, for the (NSCDC) office complex and (NMPWH) housing unit sites, Minna. (Thickness of 12mm – 13mm)

$$\text{Productivity} = \frac{\text{Output}}{\text{Input}}$$

$$\text{Productivity} = \frac{\text{surface plastered in m2}}{\text{number of masons}}$$

Table 5: Shows that the average output for plastering work was 26.60m2 per day for the (NSCDC) site and 20.60m2 per day for the (NMPWH) site on a scale of 3m height and above respectively. Activities of the plastering work was measured for the 5 days of observation on both of the construction sites, both of the sites were supervised by construction professionals, who were always on site to monitor the activities of the workers. From the data obtained via measurement and time study, it was observed that both of the sites exceeded the standard of mason's work on plastering per day via literature, which is 18m2 per day as established by Consol's (2010). Through there was a significant difference between the productivity level of the (NSCDC) and (NMPWH) site which must have been as a result of the fact that the (NSCDC) site plastering work was task based 'contract or finish and go' while that of (NMPWH) was time based 'daily pay'.

Table 5: Masonry Productivity (plastering in M^2/Day)

S/No	Ground floor (3m high) for (NSCDC)	Time taken (hr)) for (NSCDC)	Ground floor (3m high) for (NMPWH)	Time taken(hr) for (NMPWH)
1	27.00	6hrs,15mins	21.10	6hrs,20mins
2	27.20	5hrs,48mins	20.00	5hrs,38mins
3	26.50	5hrs,40mins	21.40	6hrs,40mins
4	26.60	6hrs, 00mins	19.80	6hrs, 20mins
5	25.70	5hrs,58mins	20.60	5hrs,30mins
Average	26.60		20.60	

Source: Field study, 2017.

DISCUSSION OF RESULTS

The discussion of the findings presented is based on the data analysis from the administered questionnaires and site observation. The study has shown that the perceptions of the relative mode of payment are statistically the same. The ranking of the various respondents on the various factors affecting workers wages in the construction industry as shown in table 4. Rating the factors affecting the workers' wages on site revealed that no-extent and low-extent factors represent 0%, the moderately low extent factors were nine (9) representing 34.62% with mean score of 2.5-3.49. This includes: Location of the work, Job required, working condition, Psychological and social factor, Remuneration in comparable firms, Trade union pressure and strategies, Government policies and regulations, Desire of a firm to build their goodwill and Performance review. It was observed that the high extent factors were sixteen (16) and represents 62.54% with mean score of 3.5-4.49 this includes: Productivity, Nature of the work, The capacity of the firm to pay, Management attitude and strategy, Cost of living, The skill level available in the labour market, Regularity of employment, Working hour, Mode of payment, Timeliness of payment, labour availability, Local climate condition of the area, Nature of equipment used, Job size and complexity, Technological development and state of the economy and the very high extent was one (1) and represents 3.85% mean score of 4.5-5.00 which was the demand for labour. This implies that the respondents for the study agree on factors that had significantly effect and those with no effect on construction workers' wages. The average productivity for plastering work for the (NSCDC) and (NMPWH) site was 26.60m2 and 20.60m2 per day for heights of 3m and above respectively.

CONCLUSION AND RECOMMENDATIONS

The study concludes that productivity is directly linked to workers' wages, and workers' wages is in turn dependent on productivity.

Based on the findings and conclusion, the following recommendations are made:

i. It is recommended that piece rate and task basis mode of job allocation should be used to allocate work to labourers for more efficiency.
ii. It is recommended that the result of this research findings on table 5 could be use to provide information upon which plastering works can be carried out.
iii. The study can be extended to other building trades like; carpenters, painters, iron benders, electricians and plumbers using the same methodology adapted in this research study.

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COST IMPLICATIONS OF REWORK DUE TO DESIGN ERRORS IN INSTITUTIONAL BUILDING PROJECTS IN ABUJA

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The impact of rework on construction project performance has become a major source of concern to construction professionals and clients of the construction industry. One of the root causes of rework is design error, as the phrase implies, it is any deviation from original design which could also mean any omission and ambiguity. Design errors occur more in the construction of frame structures because of the complications involved in their designs. The aim of this research is to determine the cost implication of rework due to design error, the relationship between cost of rework due design error and the initial contract sum and final contract sum of institutional building projects in Abuja. Institutional building projects are basically framed structures; hence the research is focused on such projects. Quantitative method of research was employed where archival data were sourced from completed institutional building projects files. The data were sorted and analysed using correlation analytical tool. The result of the analysis revealed that a positive correlation exists between rework cost and final contract sums. Secondly the initial and final contract sums were found to be significantly affected by rework. The study concluded that rework occurrence due to design error(s) automatically results to a significant increase in the contract sum which could lead to other issues such as delay in project completion and in extreme cases project abandonment. The study recommends the introduction of multidisciplinary design team during the design stage and ample time for all involved so as to reduce the rate of errors, omission and ambiguity. Clients should be advised on the cost implications of frequent changes which usually leads to rework so as to get detailed client brief during the design stage before construction commences.

Keywords: *Design errors, Institutional buildings, Project cost, Rework.*

INTRODUCTION

Design errors are problematic in construction and engineering projects. They have been recognised to have created an unsafe and unpleasant environment which can result in casualties (Love *et al,* 2010). Design error is a deviation from a drawing or specification, also including omission and ambiguities. Professionals in the built environment and civil engineering still find it difficult particularly with identifying and preventing design errors (Lopez *et al*, 2010). Design errors continued to be a major factor to building failures, time and cost overruns (Sun and Meng, 2009). Generally, it is during the execution and implementation stages of projects that design errors are noticed and identified which usually leads to rework (Oyewobi *et al.,* 2011). The extent of this error is what must be looked into in other to determine the consequence on the overall project cost.

Rework has become a frequent happening in construction projects and has been identified as one of the factors that can reduce the quality of project performance. "the construction industry institute (CII, 2001) defines rework as an activity that has been done more than once or activities that remove work previously installed as part of a project". Under the pressure to improve project cost and schedule performance many companies have embraced the speed up approach in which the design phase and the construction phase overlap (Pena-mora and Li, 2001).

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Due to this phase overlap the contractor can start the construction phase with flawed or defect plans that have undiscovered errors. This undiscovered rework in the design stage can bring about a major amount of rework in the construction phase. The architects play a very vital role because any deficiency or errors in the inception phase may lead to successive deviation in the construction phase (Oyedele and Tham, 2007).

Love *et al* (2009), argued that the longer an error stays undiscovered and undetected the more the possibility of rework occurring which significantly affects cost and schedules. According to (Love *et al*, 2009) there are a number of silent condition within a project that that causes error provoking activities to take place and therefore contributes to rework occurrence downstream during construction. Furthermore, (Love, 2002a) found out that indirect cost of rework could be as much as five times the cost of rectification. There is a great need to reduce rework cost for projects performance and productivity level to improve (Love, 2002).

Rework in the Construction Industry

The occurrence of rework obviously has an adverse effect and influence on project performance as it leads to cost and time overruns. Palaneeswaran (2006) upheld that rework has both direct and indirect impact on project performance. For example, in poorly managed projects, the gross impacts of rework (that is, both direct and indirect) could be equal to or even outdo the estimated profit margin levels. Likewise, in some cases there will be some carry forward ripple effects on different aspects such as stress, motivation, relationships and reputation. He acknowledged the following direct impact of rework on project management transactions: additional time to rework, additional costs for covering rework occurrences, additional materials for rework and subsequent wastage handling, and additional labour for rework and related extensions of supervising manpower. Love (2002b) resolved that rework can totally affect an individual, an organisation and a project's performance indirectly. Once design error is noticed and identified rework is inevitable. The extent of rework that emanate is however dependent upon when it was identified in the project life cycle (Lopez and Love 2012). Rework is a prominent factor that contributes negatively to the construction process and directly leads to client dissatisfaction, reduces profitability and in extreme conditions leads to hostile relationship between participants which could be settled either by arbitration or the court of law (Love, 2002a). Oyewobi and Ogunsemi (2010) emphasizes that a project must be well conceived, must start on a right note in order to end well. At the beginning of the planning stages, the building owner, the initiator of the contract and the designer must come together and plan the work appropriately in order to prevent the occurrence of rework. Inadequate planning can affect a well-conceived construction project, leaving all the participants, designers, clients and contractors, discontented at the completion of the project. Thus, as construction involves the execution of a design envisioned by the architects and engineers, ineffective implementation of this design process will inevitably lead to rework and result in time and cost overruns in both the design and construction phase (Oyewobi and Ogunsemi, 2010).

Rework occurs due to so many factors such as errors in design, construction failure and change order, inadequate coordination, ineffective and inefficient communication among stakeholders of the project (Oyewobi *et al*. 2011). It is found that owner change and design error/omission seems to be the root cause of rework having a relatively greater cost implication than the other factors aforementioned (Hwang *et al*., 2009). Wasfy (2010) recorded that other causes of rework in construction projects includes; unskilled supervision, insufficient supervision, poor workmanship, improper subcontractor selection, inadequate work protection and inappropriate work sequencing.

The direct effect of rework on construction projects consist of; time overrun, this is the extra time taken to carry out rework, additional cost to rectify the defect, increased volume of materials as against the budgeted volume in other to carry out rework, wastages, increase in labour cost to make good defect (Palaneeswaran et al. 2005). Rework occurs more often in building works due to reasons which includes: different interface related issues e.g. lack of coordination between main building contractors and building services contractors, poor communication between design team and construction team (Palaneeswaran, 2006). The time frame of cost tracking includes the length of time rework is identified, the time required to carry out the rework and the time required to gear up and carry on with the original scope of work (Fayek *et al.,* 2003). Timely identification and correction of rework e.g. due to design error, defects, non-conformance are important for controlling the adverse effect of

rework on cost and time (Palaneeswaran, 2006). The root causes of rework can be grouped into different categories these are; client related factors, design related factors and contractor related factors including site management and contractor factors (Love and Edwards, 2004).

Causes of Rework

According to Anjana and Christopher (2016), the causes of rework is classified under client related factors, design related factors, contractor related factors, site management and subcontractor's factors. The major factors that contributes to client related rework is poor communication between design consultants and the clients, this implies that there is little interaction between the clients and the design team consultants to make sure that the client ideas are communicated properly and due to this rework springs up right from the initiation stage, proceeding through an incubation system and at the long run manifesting itself during the implementation stage. The predominant factor that leads to design related rework is the changes made to the design at the request of the client, this means that most clients lack the required experience as regard the design process and as a result their ideas may not be feasible during the design. The site management related factors usually springs up due to inexperience and also the inability to effectively communicate with the subcontractors which leads to deviation from drawings, poor coordination of resources and setting out errors. Love et al. (2005) resolved that variations during the design process are frequently captured too late because of the successive communication structure of supply chains, and the lack of coordination and integration between design team members. The lack of coordination among design consultants led to major design-related changes which affected all the design firms involved. This subsequently resulted in changes on site, which affected most of the subcontractors.

Design Errors

Tuker and Edmonson (2002) define design error as the carrying out of a task that is either unnecessary or incorrectly done. Furthermore, (Reason and Hobbs, 2003), define error as the failure of planned actions to achieve their desired goals, where this occurs without some unforeseeable or chance intervention. Design error is a deviation from a drawing or specification, also including omission and ambiguities. Failure is usually used interchangeably with error, but however there is a slight difference between expected and observed performance. (Ayininuola and Olalusi, 2004).

Sources of design error

Mryyan and Tzortzopoulos (2013) identified the sources of design errors and it is classified under the following headings: errors attributed to the client, errors attributed to failure to implement regulations and building codes, errors attributed to lack of details in drawing and/or mis-interpretation of drawings.

Rework and Design Errors

Previous studies have shown that substantial quantity of rework is design related (Love, 2005). This design related rework are changes made by different parties involved in the process which includes clients, contractors, subcontractors, end users and regulatory bodies. The design related factors as outlined by (Palaneeswaran,2006) includes factors such as;

i. Ineffective use of quality management practices.
ii. Ineffective use of information technology
iii. Poor coordination between different design team members
iv. Time boxing/fixed time for a task
v. Poor planning of workload
vi. Lack of manpower to complete the required task
vii. Design team turnover/reallocation to other projects
viii. Not enough time to prepare contract documents
ix. Insufficient client brief to prepare detailed contract document.

Cost and Rework

Love (2002b) suggested that design and construction organisations must implement a quality management system, supported by a quality cost system, in order to lessen the costs of rework. Only when organisations begin to measure their rework costs carefully will they fully appreciate the economic benefits of achieving high quality. Love (2002b) emphasized that there is a lack of uniformity in the manner in which rework cost data are collected due

to the various interpretations as to what constitutes rework. Barber *et al*. (2000) acknowledge that the cost of rework could be as high as 23% of the contract sum, with a number of factors contributing to rework cost. These factors according to Love (2002b) includes; the extent of quality management practices implemented, the type of project being executed, the method of procurement used and the complexity of the project. Love and Li (2000) found out that the cost of rework for a residential and industrial building was 3.15% and 2.40% respectively of the value of the contract sum. the economic benefits of recording incidences of rework and quantifying its costs have been overlooked.

RESEARCH METHOD

Data was collated from secondary and primary sources. Review of past literatures was used to obtain the root causes of rework and causes of design related rework of rework. The use of checklist to access archival data, such as original contract sum, final contract sum and cost of the rework carried out on the project. This was analysed using correlation analysis and relative importance index (RII). There was also collation of secondary data from books, past works of eminent scholars related to the topic under investigation. The population for the study is comprised of the construction companies registered with Abuja's business directory which is 244 as at March 2017. Considering the population size identified, the sampling frame was limited to Abuja, questionnaires was distributed to registered construction companies with Abuja business directory. The sample size for the study from the study's population (244) will be 71 based on Yamane, 1967 formula as given below using 10% level of accuracy, 95% certainty level, 50% level of inconstancy and a purposive sampling. From the entire population of this study which was 244, sixty-four (64) questionnaires were retrieved accounting for 90% of the limit set for the questionnaire which was seventy – one (71) questionnaires. also archival data of ten institutional building projects in Abuja was retrieved.

RESULTS AND DISCUSSION

There are three (3) variables in this research work. These variables were used in the process of analysing the raw data. They are; Initial Contract Sum, Final Contract Sum, Cost of Rework.

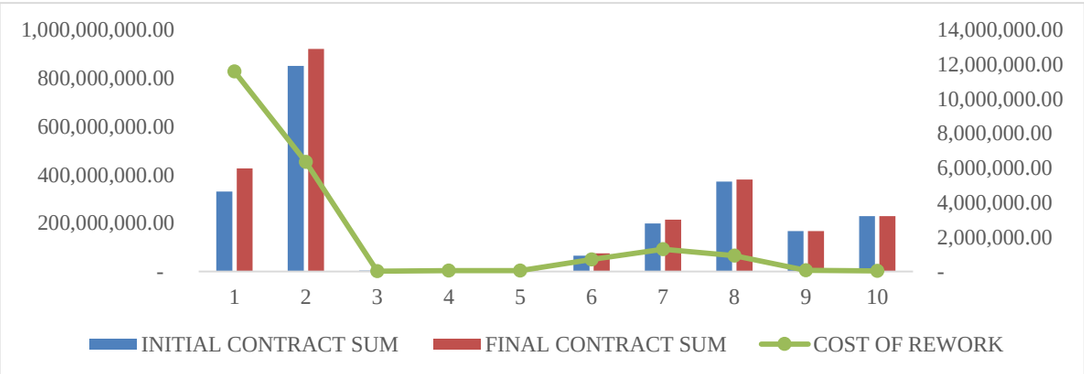

Figure 1.1: Initial Contract Sum, Final Contract Sum and Rework Cost
Source: Researcher's Data Analysis (2017)

From figure 1.1 shows the initial contract sum, final contract sum and rework cost of the selected building projects. On average, it was discovered that the rework cost is quite significant.

Table 1.1: Causes of Rework on Institutional Buildings

Causes	1	2	3	4	5	RII	Rank
Design related factor	1	3	8	25	27	0.74	1st
Client related factor	0	2	14	34	14	0.70	2nd
Contractor related factor	0	2	24	33	5	0.65	3rd
Sub-contractor related factor	0	9	43	11	1	0.54	4th

Source: Researcher's Analysis (2017)

Table 1.1 shows the ranking for the causes of rework that has occurred in the project executed by the respondents' firm. Design related causes had the highest ranking thereby

coming 1st with RII of 0.74, followed by client related causes coming 2nd with RII of 0.70, contractor related causes came 3rd with RII of 0.65, lastly sub-contractor related with RII of 0.54. This shows that all the causes of rework are quite significant.

Table 1.2: Causes of Design Related Rework on Institutional Buildings

Causes	1	2	3	4	5	RII	Rank
Insufficient client brief to prepare detailed contract document	0	3	10	29	22	0.73	1st
Not enough time to prepare contract documents	0	7	16	33	8	0.65	2nd
Ineffective use of quality management practices	0	4	27	27	6	0.63	3rd
Poor coordination between different design team members	0	7	29	23	5	0.61	4th
Time boxing/fixed time for a task	0	8	33	22	1	0.58	5th
Ineffective use of information technology	1	13	28	18	4	0.56	6th
Design team turnover/reallocation to other projects	3	19	22	13	7	0.54	7th
Poor planning of workload	0	19	31	11	3	0.53	8th
Lack of manpower to complete the required task	6	19	28	9	2	0.48	9th

Source: Researcher's Analysis (2017)

Table 1.2 shows the causes of design related rework on projects executed by the respondents. Insufficient client brief to prepare detailed contract document came 1st with RII of 0.73, Not enough time to prepare contract documents followed 2nd with RII of 0.65, Ineffective use of quality management practices, Poor coordination between different design team members, Time boxing/fixed time for a task, Ineffective use of information technology, Design team turnover/reallocation to other projects, Poor planning of workload and Lack of manpower to complete the required task came 3rd, 4th, 5th, 6th, 7th, 8th and 9th with RII of 0.63, 0.61, 0.58, 0.56, 0.54, 0.53 and 0.48 respectively. This shows that all the design related causes of rework are quite significant.

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Correlation Analysis

Table 1.3: Correlation Matrix of the Relationship Between Rework Cost and the Selected Variables

	Initial Contract Sum	Final Contract Sum	Rework Cost
Initial Contract Sum	**1**		
Final Contract Sum	**.996****	**1**	
Rework Cost	**.582**	**.652***	**1**

****. Correlation is significant at the 0.01 level (2-tailed).**

***. Correlation is significant at the 0.05 level (2-tailed).**

Source: Researcher's Analysis (2017)

From table 1.3 shows correlation analysis results. The relationship between rework cost and the selected variables was examined using correlation, it was found that; rework cost and initial contract sum were moderately positively correlated, r (10) = 0.582, p = 0.077 and rework cost and final contract sum were positively correlated, r (10) = 0.652, p = 0.041. This indicates that initial and final contract sum are affected by rework cost

DISCUSSION OF RESULTS

The result of the analysis on the causes of rework shows that design related rework has the highest ranking with RII of 0.74, this is in line with the findings of Love (2005) which states that substantial quantity of rework is design related. This design related rework are changes made by different parties involved in the process which includes clients, contractors, subcontractors, end users and regulatory bodies. As construction involves the execution of a design envisioned by the architects and engineers, ineffective implementation of this design process will inevitably lead to rework and result in time and cost overruns in both the design and construction phase (Oyewobi and Ogunsemi, 2010). The causes of design related rework on projects executed by the respondents, shows that Insufficient client brief to prepare

detailed contract document came 1st with RII of 0.73, this also conforms to the findings of Hwang *et al* (2009) who stated that owner change and design error/omission seems to be the root cause of rework having a relatively greater cost implication. Not enough time to prepare contract documents followed 2nd with RII of 0.65, Ineffective use of quality management practices with RII of 0.63 came 3rd, while Poor coordination between different design team members has RII of 0.61.

The correlation analysis of the cost implication of rework indicates that the initial and final contract sum are significantly affected by rework cost in most scenario, when rework occur in construction project it increases the contract sum of such project which could either lead to project delay or abandonment in extreme cases.

CONCLUSION

The study concludes that the root causes of rework which are classified as design related causes, client related causes, contractor related causes and sub-contractor related causes all have significant effect on project with design related factors taking the lead. This is because most times errors, omissions and ambiguity in design gives way for other factors to surface. Also it is concluded that the frequency of rework in building projects most especially institutional buildings which are mostly frame structures is quite high and also have a significant cost implication on the overall project as most of the design related rework is usually found on the structural components i.e. the columns, beams and slab.

It was also concluded that the initial and final contract sum are significantly affected by rework. The occurrence of rework changes the initial by increasing the final contract sum, this has an adverse effect on project delivery as it sometimes leads to project abandonment in worst scenarios and also extension of the completion time in less complicated scenarios.

Finally, the study also concludes that ways in which design related rework reduced have not really been adopted by most firm except for the increased use of computer aided design/engineering technologies. Other ways that has been identified from previous research to be very effective such as introduction of multidisciplinary design team and proper implementation of procurement strategies at the design stage have not been widely adopted. design related rework reduction is very keen if the construction industry to make headways and deliver quality projects to meet clients' satisfaction.

RECOMMENDATIONS

It is recommended that the introduction of multidisciplinary design team during the design stage should be adopted by both clients and professionals so as to reduce the rate of errors, omission and ambiguity. Secondly, clients should be advised on the cost implications of frequent changes which usually leads to rework so as to get detailed client brief during the design stage before construction commences.

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EVALUATION OF THE NIGERIA CONSTRUCTION INDUSTRY PREPAREDNESS TO ADOPT SUPPLY CHAIN MANAGEMENT PRACTICES

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Supply chain management has received a lot of attention in the third world countries since the latham and Egans report due to benefits such as streamlining extensive cost and time overruns which have besieged the Nigerian construction industry, in Nigeria However, it is yet to receive such attention. This research through the use of questionnaire administered to professional in the built environment sought to elicit information on the construction professionals level of awareness, level of involvement in supply chain management, the benefit so derived from the adoption of supply chain management and limitation to its full adoption as well as the degree of preparedness of the industry as a whole to adopt supply chain management. Of the 385 questionnaires distributed 200 were returned (52%). It indicates that professionals to certain degree are aware of supply chain management practices with the top three being relationship development, management leadership, and information sharing. Professionals are also involved in supply chain management practices with the top three being information sharing, early appointment of partners, and relationship development. Top three benefits of supply chain management according to respondents are better resources utilization, Cost saving and improved productivity while the limitation to adoption of supply chain management has lack of management support, dearth in understanding of supply chain management concept and poor organisation structure as top three. The level of preparedness of the construction industry was determined using VERDICT readiness assessment model and reveals that the industry has achieved process readiness but is yet to achieve management, people and technology readiness.

Keywords: supply chain management, construction industry, preparedness, practices, Awareness, Nigeria**.**

INTRODUCTION

The idea of Supply Chain Management (SCM) originated from the manufacturing industry with its first visible signs traced to Toyota Motor Factory which used the concept to regulate supply (Vrijhoef & Koskela, 2000). The construction industry possesses a lot of similarity with manufacturing industry which makes SCM adoptable to the construction industry (Aloini, *et al* 2012). Its goal was to greatly decrease inventory, reduce cost and duration of project thus improving project performance, to transfer site activities offsite to a more favourable condition, and to use integrated management options so as to effectively regulate supplier interaction (Saka & Mudi, 2007). The Nigerian construction industry is however known for high inventory, absence of formal relationship and interaction with supplier (Saka & Mudi 2007), and cost and time overruns (Babalola *et al* 2012). The Nigeria construction industry faces immense challenges in managing its supply chain which is critical to a successful project delivery Saka & Mudi (2007). These challenges in the opinion Aje *et al* (2015) could have resulted from paucity of awareness or paucity of involvement in supply chain management practices by various professionals. Aje *et al* (2015) surveyed the extent of awareness and involvement of quantity surveyors in supply chain management practices and concluded that though the awareness was high, the level of involvement of quantity surveyors was however low, this is a result of inadequate infrastructure in information Technology.

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The extent of awareness and extent of involvement of other professionals is the Nigeria construction industry is yet to be determined. The implementation of supply chain management is limited by paucity of understanding of supply chain management concept, unclear strategic benefits to the organisation; lack of trust among other limitations which has restrains its adoption and application in the Nigeria construction industry (Amade *et al*, 2016). Supply Chain management in Nigeria is also restricted by the difficulty of operating in the business environment in Nigeria which is characterized by poor infrastructure such as bad road, the unstable socio-political environment in Nigeria, corruption pandemic even among security and law enforcement agencies further limits the adoption of supply chain management in Nigeria.

The average level of awareness and involvement of quantity surveyors in supply chain management as asserted by Aje et al (2015) could be an outcome of the degree of preparedness of organisations in the construction segment to adopt supply chain management practices which Saad, *et al* (2002) opined that is a fundamental issue that affects the effective adoption of supply chain management.

Problem Statement

Supply chain management is a network of organizations or entity, that are tied through an upstream and downstream linkages via different processes and activities with a view to producing valuable goods and services to satisfy end users Tiwari *et al* (2014). Supply chain management is therefore important to satisfying the clients and end-users. This highlights the need for professionals to be aware, and fully involved in supply chain management encouraged by an industry prepared to fully adopt the innovation.

Aje *et al* (2015) investigated the level of quantity surveyors awareness of supply chain management praxis; the research similarly examined involvement extent of quantity surveyors and factors constraining their involvement in supply chain management activities. Amade *et al* (2016) asserts that paucity of understanding of supply chain management concept alongside unclear strategic benefits is the major constraints to the deployment of supply chain management. construction industry's Supply chain management is however not narrowed to quantity surveyors alone as all parties plays a crucial role it is therefore imperative to investigate the extent of awareness of other professionals in the built environment and construction practices, their level of involvement in supply chain management activities alongside the constraints to successful adoption of supply chain management practices.

Saad *et al* (2002) identified and raised a fundamental issue related to the effective implementation of supply chain management practices which is the degree of preparedness of the organisation to adopt supply chain management practices. This was confirmed in Aje *et al* (2015) where there was an average level of awareness of supply chain management practices among quantity surveyors however; there was low level of participation and involvement of quantity surveyors in supply chain management practices. This could be attributed to the degree of preparedness of the organisation towards adopting supply chain management practices.

It is consequently imperative to ascertain the degree of preparedness of organization towards adopting supply chain management practices alongside barriers that restrain the effective implementation of supply chain management despite the benefits of this innovation.

LITERATURE REVIEW

The Concept of Supply Chain Management

The concept of supply chain management is believed to have stemmed from and thrived well in the production and manufacturing segment. The first obvious evidence according to Adebayo (2012) and Shingo (1988) in Vrijhoef and Koskela (2000) were in JIT delivery (appropriate delivery time) system used by Toyota Automobile; it's a practice that was majorly to regulate the supply of Toyota Products in the appropriate small quantity in the

appropriate needed time. Deming (1982) asserts that the stimulus was born in 1950 when Deming in a statement to Japanese leaders suggested a collaborative working which incorporates suppliers in a long term relationship built on trust and loyalty would lead to improvement in quality and decrease unnecessary high production cost. Vrijhoef and Koskela (2000) and Chen (2004) stipulates that the idea of supply chain management was introduced from the management principle during the 1960s, on the conviction that a solitary activity cannot guarantee the success of a system or series of activities.

The concept can be said to have emanated from the need to improve performance by improving quality, decreasing cost and time of production. The concept of supply chain management having worked effectively in other segments needs to be adapted to the sector of construction in spite of the difference of this sector with other sectors like the manufacturing and production in these three ways; projects are one-off in nature, production are usually onsite and organisation is temporal (Koskela, 2003 as sighted in Khalfan, 2004) efforts have been made by researchers and workers in the construction industry to implement this concept

Supply Chain Management like other innovations from the production and manufacturing industry was developed in the 1960s based on the conviction that a solitary activity from a party (be it client, consultant, contractor or subcontractor) cannot ensure the effectiveness of an entire system (Chen, 2004). A supply chain therefore consist of a network system of that shows the relationship and interdependencies of all parties (client-supplier, consultant-main contractor, and sub-contractor–manufacturer) and the transfer of money, material, ideas and resources, information and knowledge to satisfy the specified requirement of the client.

Readiness Assessment Models

To ascertain the degree of preparedness of the construction industry to adopt supply chain management a model for assessing Readiness would be used. This tool has been used to determine the readiness of organisations, societies and even nations to adopting certain innovations and practices such as e-commerce readiness, IT readiness, and lean construction readiness. It is therefore a viable tool for determining the preparedness of the construction industry in Nigeria to adopting supply chain management practices.

Readiness has been defined by various authors in literature. Each of the various definitions of readiness from literature is dependent on the context, and subject matter. The first attempt to define readiness as available on known literature was by CSPP (computer system policy project) in 1998 which attempted to define readiness as defined with reverence to a society which has sophisticated internet access and application of information technology in schools, homes, offices, business centres, healthcare facilities; user confidentiality and security when online; and policies of government which are encouraging in advancing use of connections to network (Beig et al 2007). Another attempt by Dada (2006) sees readiness as ―the extent of the degree and level to which an economy be it a sector, country, nation may be ready, prepared or willing to achieve the advantages and dividends that result from information and communication technologies (ICT).

Readiness as defined by the authors above depends on the context and perspective being viewed by the author. In this context it can be defined as a measure of capability and preparedness to adopt a new paradigm shift of supply chain management. Earlier before the adoption of this paradigm so many models for assessing and determining readiness have been developed. Ruikar *et al* (2006) asserts that each instrument measures how prepared an economy or a community is to gain from information and communication technology, e-commerce, etc. Peters (2001) conversely, asserts that the range of instrument employs broadly diverse methods for readiness assessment which includes different measurement approach. Each assessment model has a distinct fundamental objective and definition of readiness where some are concerned with readiness of an economy especially of communities and nations to embrace information and communication technology by adopting internet technologies on a global platform, some are more interested in determining the readiness of a specific entity or industrial sectors to embrace certain innovation or technologies, this research is concerned the readiness of the construction industry to embrace the new paradigm shift to supply chain management.

some instruments determines readiness of a country and an economy to adopt and apply information and communication technologies on a universal basis, whereas others concentrate more on determining the readiness of particular sectors like the construction sector to embrace or apply certain technologies such as supply chain management. Centre for international development (CID) of Harvard University in 2001 developed a model called "Readiness Index model" which measures a countries capacity to utilize information and communication technology facility. In its definition of readiness sees it as the extent to which a society is prepared or ready to partake in a network developed society and its development to join a globally networked society of the nearest future (Kirkman *et al.,* 2002) as cited in Olamilokun (2014). In the same way, the Asia Pacific Economic Corporation (APEC) e-readiness assessment concentrated policies of government for e-commerce, whereas Mosaic global diffusion of the internet project readiness assessment instrument which targeted evaluating and assay the growth of internet world over (Ruikar *et al*, 2006).

In another context other models were more concerned with measuring the readiness of a sector to adopt certain engineering concept and approaches. For instance, Readiness Assessment for Concurrent Engineering (RACE) invented in Virginia University, America during the early 90s. It covered two major aspect or components which include process aspect and technology aspect. It is commonly used in software engineering, and automotive electronic industries (Ruikar *et al.,* 2006). Race can however, be adapted for usage in the construction industry as asserted by Khalfan and Anumba (2000). Furthermore, Supply Chain Assessment and Lean Evaluation System (SCALES) specially invented for the manufacturing industry in so as to determine companies'(especially SMEs) preparedness for adopting supply chain management practices and Lean manufacturing techniques. Similarly, Standard process Improvement for concurrent Engineering (SPICE) invented by the University of Salford, United Kingdom in 1998 was developed to determine key construction process within construction organisations (Spice Questionnaire, 1998). Furthermore, Benchmarking and Readiness Assessment Model for Concurrent Engineering (BEACON) developed for appraising the construction companies' degree of preparedness in applying concurrent engineering for the purpose of enhancing the process of project delivery. Additional models developed include the Capability Maturity Model (CMM) invented for developers and evaluators of software, and the IQ Net readiness scorecard (Khalfan and Anumba, 2000); (Ruikar *et al.,* 2006) and (Aminali, 2007) as in Olamilokun (2014).

The models for assessing readiness that is particular interest to this research is the VERDICT (Verify End-User e-Readiness using Diagnostic Tool) which is applicable to evaluate the degree of preparedness of construction companies, and sections within an organisation or company, as well as subdivisions within a section Aziz and Salleh (2010). It is a useful tool in measuring readiness of construction organisation for e-commerce (Ruikar *et al*, 2006). The key aspects to be considered for the successful implementation of verdict are; people, process, technology and a leader (management) to properly conduct and orchestrate the other aspect. The manager or management acts as the conductor, which coordinates the people, process and technology to achieve the adoption of a technology. All four aspects need to work complimentarily for an establishment or company to achieve e-readiness.

Ruikar *et al* (2006) asserts that after questionnaires have been successfully completed the report which summarizes e-readiness is presented to the users. The e-readiness assessment result comprises data in both text and graph formats which are subdivided into sections and tables with colour representing the summary of assessment as follows:

a. Red colour is used to indicate an average score of between zero and 2.5. Red used denotes that several aspects within a category need to be attended to urgently in order to attain readiness; and
b. Amber colour is used for an average score of between 2.5 to 3.5. Amber used depicts that certain aspects of the category needs to be attended to before achieving readiness; and
c. Green colour is used for an average score of 3.5. Green used in this sense implies that the organization has attained full readiness and that organization is matured and has the ability required in these aspects.

Aspects of Verdict Readiness Assessment Model

Several publications and articles point to the fact people, process and technology are key aspects considered for the implementation of any technology (Aziz and salleh 2010, and Ruikar *et al* 2006). Emmett (2002) as cited in Ruikar *et al* (2006) however asserts that people, process, and technology are in need of someone to lead same way a conductor leads an orchestra. Emmett (2000) however draws example from the performance of an orchestra where you have "people" as musicians, "process" musical scores, and technology "musical instruments", there is need for a leader/management provided by the conductor (leader/management) and coordinate the affairs.

People who have the required skill and understanding of and believe in technology is a key element of the verdict model, the people need to have the capability to apply the change and move to adopt quickly supply chain management, the staff has to be trained, and also improve their information technology knowledge. The organisational structure should be such that permits innovation and growth.

The organization technology facilities and infrastructure required for the sustenance of business functions, IT facilities should be made available, the organizational policy should be such that supports innovation and technology, and software facility related to such expertise should be made available to the organization

The process/project readiness should be such that support the successful adoption of supply chain management, it should display high level of quality assurance, and the use of supply chain management should reduce risk and improve client satisfaction

The management system should be such that have confidence in technology, and ensures planned tactical steps to initiate its application and utilization in order to obtain the dividends of supply chain management.

RESEARCH METHODOLOGY

The study adopted purposive sampling method to elicit information that is quantitative in nature. Questionnaires were administered to professionals on a sample comprised of duly registered construction firms of various sizes who remit their taxes with the Federal Inland Revenue Service of Nigeria (FIRS); a statutory authority mandated for the collection of taxes in Nigeria. According to the FIRS (2016), there are Ten thousand, two hundred and thirteen (10,213) active contractors across the country (Abdullahi, *et al* 2017). This is due to the fact that only companies who have remitted their tax are legally qualified to operate in Nigeria.

Building consulting and construction companies in Abuja, Nigeria were chosen for the population for this study. Building consulting and construction companies were chosen on the basis that they are a major party responsible for the application of supply chain management in the built environment; obtaining details with regards to their practices of supply chain management concept would provide an indication to how much professionals are aware of the concept. Abuja was equally chosen on the basis that they are developed and has a large concentration of building construction firms (Olajide, 2014).

The sample size of the research was calculated using Yamanes' (1986) formula for calculating sample size as indicated below.

$n= N/1+N(e)^2$

Where n represents Sample Size, N represents population= 10213, e=0.050

$n=10213/1+10213(0.050)^2$

Therefore, the sample size equals 385 (three hundred and eighty five)

DATA ANALYSIS

Descriptive statistics data was used to gain an overview of numeric data obtained from questionnaire administered. Data obtained from a questionnaire which is quantitative in nature and would require descriptive analysis, using frequencies, and mean score. Data was presented with the use of tables for all sections of the questionnaire. A reliability analysis using the Cronbach's alpha was applied to assess the internal consistency thus the reliability of the scale used for the questionnaire.

The second section of the questionnaire (degree of preparedness), was analyzed using the VERDICT readiness assessment model outlined by Ruikar *et al.* (2006). The assessment model "VERDICT" was adopted for the readiness assessment in this study as Abubakar (2012) noted, it is relevant for application to determine the degree of preparedness of organizations and companies, departments within an organization, or sections and subdivisions. Furthermore, colour indicator in form of lights from traffic used in this model shows the strength of the organization and weakness of the organization, visibly pointing parts that required to be improved upon. As outlined by Ruikar *et al*. (2006), the readiness assessment reports comprises of data presented both text and graphical form and are broken down into three sections as follows:

- Table showing summary of average scores in each category;
- Radar diagram showing overall scores; and
- Summary containing all responses.

The table showing summary of mean scores for each Aspect presents responses to various Aspects i.e. Management, People, Process, and Technology and presents the mean score in each Aspect. As outlined by Ruikar *et al.* (2006) an average of the score is taken, and based on the mean score, respondents are shown with traffic light' indicators which are red light, Amber light and green lights, to visually represent their readiness in each category, where:

- A mean score of between zero and 2.5 is represented with a Red which signify that several aspects within needs urgent attention to be prepared; and
- A mean score of between to 2.5 and 3.5 is represented with Amber colour signifies that certain aspects within needs attention to be prepared; and
- A mean score above 3.5 is represented with a green signifying that the organisation is fully matured and prepared.

The summary of all responses on the other hand, would include a list of all the assertions responded to by the respondents and the corresponding average score for each response, as well as emphasize of exact points within each aspect that needs to be improved upon to achieve readiness (Ruikar *et al.*, 2006). This studies however, only considers textual formats of the readiness assessment report (table with the summary of average score in each category and summary of all responses), and would be adopted. The graphical format of the report (radar diagram of overall scores) would not be considered because as explained by Ruikar *et al*. (2006), the radar diagram gives the professional a pictorial representation of their own level of overall readiness and compares it to the best-of-breed in construction. Best-of-breed for the Nigerian construction industry in terms of supply chain management in construction is however not available.

Response rate and information relating to respondents

Table 1 Percentage of Questionnaires Returned and Not Returned

Questionnaire	Number	Percentage
Distributed	385	100
Completed and returned	200	52
Not Returned	245	48

Table 1 shows the response rate of respondents in the study. As shown in this Table, out of a total of 385 questionnaires distributed, only 200 (52%) were completed and returned, while the remaining 245 (48%) were not returned. However, going by Moser and Kalton in Olajide (2014) assertion that the outcome of an investigation should be regarded as being biased and of little importance if the questionnaire returned is less than 30-40%, the number of questionnaires completed and returned were therefore considered adequate for analysis.

Table 2 Information relating to respondents

Academic Qualification	Number	Percentage
HND	77	38.5
B.Sc/B.Tech	75	37.5
M.Sc/ M.Tech	48	24
Ph.D	0	0

Table 2 provides information relating to respondents for the study. As shown in the table, 38.5% of the respondents had HND, 37.5% of the respondents had B.sc/B.Tech, while 24% and 0% had M.Sc/ M.Tech and Ph.D respectively. This shows that respondents have the relevant academic qualification to respond to the questionnaire.

Table 3 Years of working experience

Services rendered	Number	Percentage
Less than 5 years	20	14
6 to 10 years	36	18
11 to 15 years	45	22.5
16 to 20 years	18	9
21 to 25 years	30	15
More than 20 years	51	25.5

Table 3, shows that respondents have varying degree of experience as 9% of the respondents had 16-20 years of experience, 25.5% had 11-15years of experience, 25.5% had more than 20 years of experience, while 18% and 14% had 6-10years of experience and less than 5 years of experience respectively. It implies that respondent have acquired enough working experience to give relevant response to the questionnaire

Table 4 below presents the extent of agreement of industry's readiness assessment. As shown in this Table, the industry's readiness assessment were considered under four headings as identified by Abubakar *et al.* (2010)'s work. The barriers were ranked 21 using their respective mean score under each heading. As shown in Table 4.2.9, management been aware of SCM practices and recognised the benefits of SCM, management at all levels in our industry's have SCM mind approach were ranked as the most important management readiness; We have credible people who are competent to apply required change and move promptly to adopt the use of SCM and staff possess all the essential aspects of IT proficiency, useful skills as well as expertise to apply SCM were ranked as the most important process/ project readiness; Having capable people to employ the change and swiftly move to adopt the use of SCM and staff having the required aspects of IT literacy, proficient expertise and skills to apply SCM were ranked as the most important people readiness; present ICT facilities of the are flexible industry's to accommodate swift modification as well as accessibility and we have functional extranet and intranet facilities that encourages information flow and dissemination and interoperability were ranked as the most important.

Table 5 Table showing summary of average score in each category of professionals of the building industry, based on boundaries defined by Ruikar *et al* (2006)

Consultants	Category Name	Average Score	Situation Based on Ruikar's boundaries
Project Managers	Management	2.77	Amber
	Process/ Project	3.8	Green
	People	3.28	Amber
	Technology	3.18	Amber
Architects	Management	2.76	Amber
	Process/ Project	3.8	Green
	People	3.28	Amber
	Technology	3.23	Amber
Quantity Surveyors	Management	2.78	Amber
	Process/ Project	3.8	Green
	People	3.3	Amber
	Technology	3.26	Amber
Engineers	Management	2.77	Amber
	Process/ Project	3.84	Green
	People	3.28	Amber
	Technology	3.25	Amber
Builders	Management	2.76	Amber
	Process/ Project	3.83	Green
	People	3.31	Amber
	Technology	3.27	Amber

Table 5 presents average scores indicating the level of readiness of each professional in each aspect i.e. management aspect, process/project aspect, people aspect and technology aspect. As outlined by Ruikar *et al.* (2006) an average score between zero and 2.5 is red, and indicates that several aspects within a category requires urgent attention to attain readiness;

4 Final organisational readiness

Readiness condition	PM	Arc.	Qs	Engrs	Builders	X
Management Readiness						
Our management is aware of SCM and recognized the benefits of SCM	3.47	3.44	3.40	3.39	3.44	3.47
All levels of management in our organization have a SCM mind approach	2.74	2.69	2.71	2.68	2.81	2.74
SCM strategy is well communicated to all levels within the organisation	2.68	2.72	2.74	2.74	2.63	2.68
We have provided adequate financial resources to facilitate SCM in our practices	2.47	2.49	2.52	2.55	2.44	2.47
We have a policy for training and capacity building to keep our staff up to date with SCM tools	2.47	2.46	2.50	2.48	2.50	2.47
Process/ Project Readiness						
We have people with ability to implement change and move quickly to adopt the use of SCM	4.16	4.13	4.21	4.16	4.25	4.16
Our staff have the necessary levels of IT literacy, functional expertise and skills to use SCM	4.00	4.05	3.98	4.03	4.00	4.00
Our current organisational structure provides an environment that is well suited to use SCM principles	3.98	4.00	3.93	3.87	4.06	4.00
Our staff fully understand the importance of Training required for using SCM tools	3.89	3.79	3.81	4.03	3.75	3.89
We have devised training procedures that will enable our staff to effectively use SCM tools	3.89	3.82	3.83	3.87	3.94	3.89
We are committed to address any issues/inhibitions that any staff may have about using SCM principles	3.79	3.74	3.76	3.81	3.75	3.79
People Readiness						
We have people with ability to implement change and move quickly to adopt the use of SCM	3.74	3.64	3.67	3.65	3.69	3.74
Our staff have the necessary levels of IT literacy, functional expertise and skills to use SCM	3.42	3.38	3.36	3.35	3.31	3.42
Our current organisational structure provides an environment that is well suited to use SCM principles	3.37	3.49	3.45	3.48	3.50	3.37
Our staff fully understand the importance of training required for using SCM tools	3.21	3.21	3.26	3.16	3.25	3.21
We have devised training procedures that will enable our staff to effectively use SCM tools	3.16	3.10	3.17	3.19	3.19	3.16
We are committed to address any issues/inhibitions that any staff may have about using SCM principles	2.79	2.85	2.88	2.87	2.94	2.79
Technology Readiness						
Our current ICT systems are flexible to accommodate rapid change and scalability	3.74	3.77	3.76	3.77	3.69	3.74
We have effective intranet and extranet facilities to facilitate information sharing and interoperability.	3.37	3.41	3.40	3.45	3.44	3.37
Our organization have well defined IT policy	3.00	3.00	3.07	3.00	3.13	3.00
We are familiar with the use of specialist software applications related to our expertise.	2.63	2.74	2.81	2.77	2.81	2.63

an average score of between 2.5 to 3.5 is amber, and shows that certain aspects within a category requires attention to attain readiness; and an average score greater of 3.5 and above

is green, and indicates that the company or organisation has the required ability and maturity in these aspects and therefore is ready (in those respects).

For this study however, it is evident from Table 1, that; the average scores for the categories; management, people as well as technology, were all greater than 2.5, but less than 3.5 (amber), for all the professionals considered in the study (Project managers, Architects, Quantity Surveyors, Engineers and Builders in Nigeria). This clearly shows that Project managers, Architects, Quantity Surveyor, Engineers and Builders in Nigeria all require attention on certain aspects to achieve management, people as well as technology readiness for adopting organisation readiness. Also, as shown in Table 1, for all the building consulting firms considered, process/project was the only category in which an average score of above 3.5 (green) was obtained. This also clearly indicates that Project managers, Architects, Quantity Surveyors, Engineers and Builders in Nigeria have the required ability and maturity required in this aspects and it's therefore ready to adopt this new innovation in supply chain management.

Table 2 shows the final readiness report of the readiness assessment carried out in the study, and provides a summary of response to all assertions put forward in each category. The essence of this report, as noted by Ruikar *et al*. (2006) is to highlight key areas within each category of an aspect that requires attention to attain readiness, thereby allowing organisations to concentrate and develop on, each aspects specified, even if they might have attained preparedness within aspect. As shown in Table 4.2.12, Project Managers, Architects, Quantity Surveyors, Engineers as well as Builders in the Nigeria construction industry, each scored less than 3.5 in all aspects of management readiness. This thus clearly indicates that they all require attention on all aspects of management to achieve management readiness to adopt supply chain management construction. Similarly, as shown in the Table, Architects, Quantity Surveyors, Engineers and Builders, scored less than 3.5 in just one aspect of project/process readiness i.e.; Present ICT facility is adequate for supporting supply chain management, while Project Management firms scored less than 3.5 in two aspects i.e.; organisational ICT facility is sufficient for supporting supply chain management and our use of supply chain management will improve health and safety during project delivery'. This clearly justifies the GREEN boundary which they all belonged to, and indicates that the construction industry is close to attaining people readiness as they require attention on at most, two aspects of people readiness.

Furthermore, Table 5 shows that Project Managers, Architects, Quantity Surveyors, Engineers as well as Builders in the Nigeria construction industry all scored less than 3.5 in almost all aspects of people readiness and technology readiness respectively. This also clearly justifies why all the professionals all lie in the amber boundary for these categories and indicates that a lot of attention is required to achieve readiness in both categories.

DISCUSSION OF FINDINGS

Level of preparedness of the Nigerian construction industry to adopt supply chain management.

The professionals (Architects, Builders, Engineers, Project Managers, and Quantity Surveyors) level of readiness was tested in categorically in four parts viz: Management readiness, project/process readiness, people readiness and Technology readiness according to Ruikar (2006) model. It was discovered that all professionals were process/project ready which indicates that the people have the capability to change and implement supply chain management, personnel are literate and have the skill and expertise to adopt supply chain management, an organisation structure that supports supply chain management, training procedure that supports supply chain management, and a strong inhibition to factors limiting the implementation of supply chain management.

The Nigeria construction industry however is yet to achieve full readiness in the other categories or aspect as discussed below:

Management and People Aspect/category requires the following to achieve full readiness; a supply chain mind approach, a well communicated supply chain management strategy by the management, it also requires financial resources to facilitate supply chain management practice as well as a policy for training and capacity building for supply chain management. While,

Technology Aspect/Category; Technological aspect or category requires the following attention to meet full readiness. They are; A well defined IT policy, intranet and extranet facilities as well as software application for specialists.

CONCLUSION AND RECOMMENDATION

In conclusion the readiness assessment result shows that the Nigerian construction industry has project/process readiness. Management readiness, people readiness as well as technology readiness however needs to be given urgent attention. Partial readiness from certain categories implies that the Nigerian construction industry is therefore not fully prepared to adopt supply chain management which reveals that certain aspects within require consideration and attention to attain readiness.

We recommend that urgent attention should be given to the aspects (Management aspect, People aspect and Technology aspect) within a category that requires attentions to achieve full preparedness so that the construction industry will be fully prepared to adopt and reap the benefits of supply chain management. Where necessary tools and equipment needs to be provided, provision should be made and where training is required, adequate training should be provided to meet readiness.

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EVALUATION OF FACTORS AFFECTING LABOUR PRODUCTIVITY IN SELECTED BUILDING CONSTRUCTION SITES IN ABUJA METROPOLIS, NIGERIA

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Labour Productivity remains an intriguing subject and a dominant issue in the construction sector, promising cost savings and efficient usage of resources if properly co-ordinated. Productivity is one of the most important issues in both developed and developing countries, because of its economic growth and social welfare. The developing countries which face unemployment problems, inflation and resource scarcity seek to utilize resources and in such a way to achieve economic growth and improve citizens' lives. Labour Productivity is an issue of importance to projects located within the Abuja metropolis, as it is considered a newly-developed area with huge number of capital projects that have been planned for the near future. Evaluating productivity output of building construction trades and the factors responsible for low labour productivity output is mostly neglected by most building contractors, hence, the aim of this research is to evaluate factors affecting labour productivity within building construction sites, through assessing labour output of different trades in selected building construction sites, evaluating factors affecting labour productivity output in selected building construction sites, determining the effects of the factors on labour productivity. Forty-five questionnaires were administered to different building professionals and contractors on the building sites in order to get their opinions. A high response levels was obtained from different professionals respectively. SPSS version 21.0 statistical techniques were employed for the analysis in this perspective. The result indicated that Builders (40%) and Architect (25%) are mostly the professionals involved in the building survey. It was also find that the impact of low labour productivity on performance of a project has high value of 42.5%, while factors like incompetence of labour with the mean value of 4.5250, accident during construction with the mean value of 4.2750 and change of government with the mean value of 4.3250 were found to have high impact on labour productivity. It is recommended that building professional should always adopt measurement of labour output of various construction trade men on building sites to avoid high impact of low labour output, using incompetent labour should be avoided and there should be adequate construction material on site for workers in order to maximize output and at the same time reduce cost.

Keywords: *Productivity, Labour, Building projects, Improvement. Construction sites*.

INTRODUCTION

Construction is a labour intensive industry and productivity of labour is one of the most significant factors which affect its overall performance, as labour costs comprises 30-50% of the overall project's cost. Mctague & Jergeas (2002). The output of the construction sector constitutes one half of the gross capital and 3 to 8% of the Gross Domestic Product (GDP) in most countries Arditi & Machtar (2000). Thus, while numerous construction labour productivity research studies have been undertaken, only a few have addressed the productivity issue in developing countries. Productivity in economics refers to measures of output from production processes, per unit of input. Productivity may be conceived of as a measure of the technical or engineering efficiency of production. Stephens and ukpere (2012). In building construction, higher productivity means seeing the final result sooner, which in turn creates satisfaction. Productivity in the construction industry is not only influenced by labour, but also by other factors such as equipment, materials, construction methods, and site management Arditi & Mochtar, (2000).

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Productivity definition varies when applied to different areas of the same industry. In construction, productivity is usually taken to mean labour productivity, that is, units of work placed or produced per man-hour. The inverse of labour productivity, man-hours per unit (unit rate), is also commonly used. Productivity is the ratio of output to all or some of the resources used to produce that output. Output can be homogenous or heterogeneous, resources comprise: labour, capital, energy. Productivity can be simply illustrated by an association between an output and an input Park (2006). Productivity is defined as the ratio of output to input, that is the ratio of the amount produced (the output) to the amount of any resources used in the course of production (the output). The resources may be land, materials, machinery, tools or manpower. The input is generally a combination of all of them. Productivity tends to increase if a greater output is achieved for the same output, or if the same output is achieved for a smaller input. In building; If input rises in direct proportion to output, then productivity will stay the same.

Labour Productivity Measurement in Building Construction

Different measures of productivity serve different purposes. It is important to choose a measure that is appropriate to the purpose. Labour productivity can be assessed by stopwatch time study; fundamental motion data, standard data, time formulas, or work sampling studies In order to measure productivity more accurately, the range of input and output quality indicators needs to be extended to Include not only goods related indicators but also service related indicators such as customer satisfaction and data on client productivity. This does not imply that productivity measures in construction projects are complicated, but rather that data should be captured from performance measures related to projects. Horner & Duff (2001) found that the productivity of two gangs doing identical jobs on the same site and at the same time could vary by up to 50 percent and the productivity of two gangs doing identical jobs in different sites could vary by 500 percent.

In particular, the measurement of construction productivity is problematic because of the heterogeneity of inputs and outputs in the industry and because of the need to measure input and output service quality. There are also problems in making international comparisons because of the absence of international classifications and conventions for measurements. A contractor is more likely to define productivity, where the units of output are specific for generic kinds of work; typical units are cubic yards, tons, and square feet.

There are many of productivity measurement techniques that can be utilized for measuring construction labour productivity. Productivity measurement can be most beneficial when various techniques are employed, such as activity sampling technique, foreman delay surveys technique, time study technique, motion analysis technique and group timing technique; between them. For productivity analysis, it is essential to identify the significant productivity factors, quantify them, and establish the relationship of these factors with each other.

Productivity for individual projects can be measured upon project completion or during construction. Productivity can be calculated on a monthly basis by estimating the floor area completed at the end of each month and dividing this figure by the total manpower used for that month.

$$\text{Building Productivity} = \frac{\text{Gross Area}}{\text{Total Manpower}}$$

Labour productivity Measurement on building construction site can be in square meter for ceiling work, floor or tiling work, and concrete in volume cubic meter, kerbs or drainage construction in linear meter. Santosh and Apte (2014).

Construction Trades in Building Industry

Different construction trades work for different construction activities. A construction trade is considered more critical if it takes a higher percentage of the total project labour cost and has more impact on the project construction time. The measurement of trade productivity is normally saved by contractors into a platform to carry out an in-depth analysis of their labour productivity performance. At the trade level, the amount of physical output per man hour is measured. A worker is deemed to be more productive if he produces more output within an hour. The indicator is calculated as follows:

$$Trade\ Productivity = \frac{Total\ units\ of\ output}{Total\ manhours}$$

The unit of measurement for trade productivity varies for different trades. For example, the unit of measurement for formwork installation is the area of formwork installed (m^2) per man-hour while the unit of measurement for electrical conduit installation is the length of conduit installed (m) per man-hour/ numbers of unit point fixed per man-hour depending on the type of electrical work at a particular time. Piqueras (2016)

In order to understand the criticality of each construction trade, we define the two following terms as follows: Construction time: is the total time needed for a construction trade to be carried out in all its aspects from start to finish during the construction phase.

Technical Nature of the Trades

With the technical Nature of the Trades there are various factors which affect trade productivity work at building construction sites.

- **i.** For example excavation work is constrained by: Method of excavation - machine excavation / hand excavation, Capacity of the equipment, Distance of cart away, earthwork on live plant, area with or without as-built or existing services details , Size of excavation e.g. trench excavation, excavation for raft foundation, depth of excavation ,type of soil e.g. cohesive or cohesion less soil, soft rock etc.
- **ii.** Formwork and Reinforcement Works on the other hand are constrained by: type of structure e.g.: footings / base, pedestal, column, base / ground slab, slabs for other floors / decking, walls, tie beam / lintel; design criterion / specialized construction. e.g: hollow core slabs, post tension slabs, water retention structure, equipment foundations and level of coordination required. E.g.: Equipment foundations with anchors, slabs with built-in services; required Accuracy / level of tolerance for the structure. E.g. blinding concrete, column, pump /equipment foundations are necessary. type / system of forms used; Reinforcement layout / arrangement; Sizes of reinforcement.
- **iii.** Concrete Works are constrained by: type of concrete mix. e.g.: blinding / structural concrete; method of mixing: Ready mix, site mix, hand mix or dry mix; method of poring and concrete with or without pump; type of casting. Cast-in-situ or pre-cast concrete; type of structure: footings / base, pedestal, column, base / ground slab, slabs for other floors / decking, slabs with or without droop beam, walls, tie beam / lintel; types and level of compaction / consolidation required. e.g: pokers; Type of finishes on concrete surface e.g fair face concrete, plaster, block work activity is constrained by: Area of block work. Partition wall or Toilet area where various in built services applicable; Types of block work namely load bearing or non load bearing, hollow or solid block; Thickness of wall; Block work height, level / height of structure
- **iv.** Plaster Work is constrained by: Thickness of plaster; number of layers; type of mix. e.g.: Mix with lime, fiber; type of substrate; type of finishes on plaster surface.
- **v.** Tiling Work is constrained by: Type of tiles. Ceramic, porcelain, granite, marble; Fixing method, height of installation, type of substrate; Area / location of installation. External, internal, wet areas, skirting, decorative etc; Type of joint, type of grouting, Floor / wall tile. Ailabouni (2010)

Factors Affecting Productivity on Building Construction Site

Productivity, especially in the construction industry, has always been very difficult to measure and control. All estimating professionals would agree that the quantity of work to be performed and the cost per hour for labour to perform that work can be established with considerable accuracy. However, it is the identifying and evaluating of the critical factors which influence productivity that provides a challenge. Motwani, Kumar, & Novakoski, (1995) . Understanding critical factors affecting productivity of both positive and negative can be used to prepare a strategy to reduce inefficiencies and to improve the effectiveness of project performance. Knowledge and understanding of the various factors affecting construction labour productivity is needed to determine the focus of the necessary steps in an effort to reduce project cost overrun and project completion delay, thereby increasing productivity and overall project performance.

Different researchers have studied the factors that affect construction productivity and the key factors are summarized and categorized based on their characteristics as stated bellow;

Atomen, Chuka, Emeka, & Samuel, (2015) identified non professionals, material shortages; variation in cost of materials, recruitment of supervisors, inclement weather, stoppage because of owner/landowners conflict, stoppage because of insolvency of subcontractor/suppliers, labour disruption, delay in material deliveries to site, disruption of power/water supply as the major factors affecting labor output. The recruitment of workers was identified as of little significance in the studied areas.

Muhammada, Sania, & Suleimand, (2015), lack of motivation and incentive, lack of equipment, disruption of power and water supply and inspection delay" are the most significant factors affecting labour productivity, Also based on the site level factors "lack of adequate skillful worker with specific scope of work" at site, delay in material supply, weather, access to the site, crew size and communication problems between foreign and local staff are the top six most significant factors affecting labour productivity.

Thomas and Sudhakumar (2014), The top five factors identified as having a significant impact on productivity: timely availability of materials at the worksite, delayed material delivery by the supplier, strikes called by political parties or hartals, frequent revisions of drawings/design, resulting in additional work/rework and timely availability of drawings at the worksite.

Amanuel, M. (2016). Indicates that the performances of building construction projects are influenced by the effect of poor labour productivity; however, most of the contractors do not have experience of measuring labour productivity on their projects due to negligence, lack of awareness and believing that measuring productivity is difficult to implement. Allison, Robert, Chapman, & David, (2009) categorizes the factors as: Skilled labor availability, Technology utilization, off site fabrication and modularization and Use of industry best practices.

The Role of Motivation

Motivation is a core managerial process of engaging employees into activities aimed at effectively achieving organizational objectives. Motivation can also be defined as a process that is initiated by a physiological or psychological need, which causes a specific behaviour or drive in order to achieve a goal or incentive. It consists of three interacting and interdependent elements - needs, drives and incentives. Most authors agree that motivation symbolizes the drive behind human behaviour. Hollyforde & Whiddett (2002)

The manager needs to know how best to elicit the cooperation of staff and direct their efforts to achieving the goals and objectives of the organization. Motivation could be extrinsic or intrinsic. Extrinsic Motivation is related to tangible rewards such as salary and fringe benefits, security, promotion, contract or service, the work environment and conditions of work. Such tangible rewards are determined at organizational level and may be outside the control of individual managers. Intrinsic Motivation on the other hand is related to psychological rewards such as opportunity to use one's ability, a sense of challenge and achievement, receiving appreciation, positive recognition and being treated in a caring and considerate manner. All these are under the direct control of individual manager.

RESEARCH METHODOLOGY

The study area for this research is Abuja FCT in north central Nigeria. It has six area councils that comprise Abuja municipal, Bwari, kuje, Gwagwalada, Kwali and Abaji area council. The choice of Abuja as the study area is because since the movement of the nation's capital to Abuja, it has never ceased to be the center of 'built – up ' environment with many infrastructures like: Buildings, roads, bridges, skyscrapers, estates ,government establishments, all kinds of private developments, schools, hospitals, theaters, cinemas, shopping malls etc. All these structures are the handwork of construction. A descriptive survey method was used, where forty-five well structured questionnaires were distributed among the principal building construction firms: Different professional and trades men are involved but of which only forty questionnaires were return from the respondents. The raw data collected were first sorted, edited and coded; broad sheets were there after used for extracting data from the returned questionnaires. These were further analyzed by using SPSS software (Statistical Package for Social Science) version 21.0 having carefully completed the variable view and imputed the extracted data.

RESULTS AND DISCUSSION

Table 4.1.1: Shows field observation and measurement of some selected trades in the building industry, each tradesmen is made up of a gang that comprises of semi-skill and unskill labour. The time period start from 8.00am in the morning and closed 4.00 pm in the evening that is 8 working hours, though break time was also included in the 8 hours. Each measurement was done by using the unit rate of each trades work. The results were obtained by finding the productivity output of each trade by taking the reading after 8 working hours, trades productivity (a platform to carry out an in-depth analysis of labour productivity performance) was calculated and the average was then taken from the result obtained from site. It could be observe that block work, plaster, tilling work are measure in square meter, accept kerbs which is in meter. Productivity in block work increases at super structure stage with output per day to be 15.96sqm and 20.88sqm respectively, while at the sub structure stage output per day was 10.8sqm, though trade productivity of each trades was calculated base on productivity output per day devided by the time period for each workers.

Table 4.1.1 Field Observation and Measurement of selected Trades in the Building Industry

Construction trade	Measurement unit	Time period (man-hour)	Productivity output per day	Trade productivity	Productivity average
Masonry Site visit 1 (forming work) Site visit 2 (block work superstructure) Site visit 3 (Slab work)	M^2	8 hours	 10.8sqm 25.96sqm 30.88	 1.35sqm 3.24sqm 3.86sqm	 2.91
Plaster work Site visit 1 Site visit 2 Site visit 3	M^2	8 hours	 16.2sqm 21.6sqm 43.25sqm	 2.025sqm 2.7sqm 5.41sqm	 3.38
Tiller work Site visit 1 (60 by 60) Site visit 2 (40 by 40) Site visit 3 (30 by 30)	M^2	8 hours	 72sqm^2 25.92sqm^2 12sqm^2	 9m^2 3.24m^2 1.5m^2	 4.58m^2
Kerbs work Site visit 1 Site visit 2 Site visit 3	M	8 hours	 25m 30m 55m	 3.13 3.75 6.86	 4.58

Source: Field Survey (2017).

Table 4.1.2 revealed that most of the professionals were Builders with a value of 40.0%, fellows by Architects with a value of 25.0 %.

Table 4.1.2 Profession of Respondents

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Architect	10	25.0	25.0	25.0
	Builder	16	40.0	40.0	65.0
	Quantity surveyor	4	10.0	10.0	75.0
	Civil engineer	8	20.0	20.0	95.0
	Others	2	5.0	5.0	100.0
	Total	40	100.0	100.0	

Source: Field survey (2017)

Table 4.1.4 revealed that there is a high impact of poor labour productivity on performance of building project with a value of 42.5% within Abuja metropolis, which implies that labour output is lower at most construction sites.

Table 4.1.4 Impact of poor labour productivity on the performance of project

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Very high	13	32.5	32.5	32.5
	High	17	42.5	42.5	75.0
	Low	8	20.0	20.0	95.0
	Very low	2	5.0	5.0	100.0
	Total	40	100.0	100.0	

Source: Field survey (2017)

Table 4.2.1 Material related factors

Descriptive Statistics					
	N	Minimum	Maximum	Mean	Std. Deviation
Shortage of material	40	1.00	5.00	4.2250	1.04973
Poor quality of material	40	1.00	5.00	4.0500	1.03651
Material storage location	40	1.00	5.00	4.1500	1.00128
Valid N (listwise)	40				

Source: Field survey (2017)

Table 4.2.1 Revealed that shortage of material on site with a mean value of 4.2250 has major effect on labour productivity compare to material storage location with a mean value of 4.15 and poor quality of material with value of 4.0500. the finding indicate that shortage of material has higher effect on labour out among materials related factors.

Table 4.2.2 labour related factor

	N	Minimum	Maximum	Mean	Std. Deviation
Incompetence of labours	40	1.00	5.00	4.5250	1.48475
Overcrowded labour force	40	2.00	5.00	3.7750	.84694
Indiscipline labour	40	1.00	5.00	3.5250	1.20868
Valid N (listwise)	40				

Source: Field survey (2017)

Table 4.2.2 Revealed that incompetence of labours at construction site with a mean value of 4.51 has major effect on labour productivity compare to Overcrowded labour force with a mean value of 3.77 and Indiscipline labour with value of 3.52. The finding implies that competent labour should be used in other to increase labour productivity.

Table 4.2.3 Health and safety related factor

	N	**Minimum**	**Maximum**	**Mean**	**Std. Deviation**
Lack of safety tools	40	1.00	5.00	4.0500	1.05125
Accident during construction	40	1.00	5.00	4.2750	1.14326
Bad health of labour	40	2.00	5.00	4.1550	.98677
Valid N (listwise)	40				

Source: Field survey (2017)

Table 4.2.3 revealed that accident during construction work has greater impact on labour productivity with a mean value of 4.2750 compare to bad health of labour with a mean value of 4.1550 and lack of safety tools with value of 4.0500.

Table 4.2.4 External related factor

	N	**Minimum**	**Maximum**	**Mean**	**Std. Deviation**
Effect of bad weather (Rain, wind, high/low tempereture)	40	1.00	5.00	4.1350	1.08338
Unforseen conditions (Ground condition)	40	1.00	5.00	4.2450	.98417
Change of Government	40	1.00	5.00	4.3250	1.07387
Valid N (listwise)	40				

Source: Field survey (2017)

Table 4.2.4 revealed that change of government on construction work has greater impact on labour productivity with a mean value of 4.3250, compare to unforeseen conditions with a mean value of 4.2450 and lack of safety tools with value of 4.1350.

CONCLUSION

Assessing labour productivity output of different trades by measuring productivity output and considering the factors and their effects at every construction stage has significance value in increasing labour productivity from the findings, the factors responsible for low labour productivity were analyzed, the finding reveals that those factors and effect were found to be: Material Related Factors, Health and safety related factor, Labour related factors, and External factors. Building professional should always adopt measurement of labour output of various construction trade men on building sites to avoid high impact of low labour output, using incompetent labour should be avoided and there should be adequate construction material on site for workers in order to maximize output and at the same time reduce cost.

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RESTRUCTURING THE CONSTRUCTION INDUSTRY AND THE BUILT ENVIRONMENT IN AFRICA: A POLYCENTRIC ENVIRONMENTAL PLANNING STRATEGY

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This paper used the Institutional Analysis and Development (IAD) framework in tandem with Knowledge Management (KM) tools to analyze the missing links between Construction Industry and the Built Environment (CIBE) on the one hand, and knowledge application to real life situations on the other hand in Africa. Major missing links between the two are: (1) the lack of institutional mechanism for the combination of, and utilisation of endogenous knowledge, raw materials, appropriate technology, (2) there are gaps between African scholars, public officials (i.e. the elite), and the local people (African realities) within the construction industry and the built environment. This paper found that the missing links constitute areas that are neglected by scholars and policymakers in harnessing endogenous knowledge and local materials towards people-centred construction industry, the built environment and industrial development in Africa. KM tools are not properly utilized to transform local raw materials into construction materials, thus, placing African countries as technology consumers rather than producers. This paper calls for restructuring of intellectual mentality as well as institutional mechanisms that shape construction industry and the built environment through polycentric environmental planning (PEP). African governments should increase research funds towards CIBE and at the same time, engineer appropriate technology in utilisation of locally available materials – iron ore, limestone, bitumen, timber, etc. Using polycentric environmental planning, this paper designs African Polycentric Technological Development Model (APTDM) for generating technologically inclined smart community and African Endogenous Knowledge Development Model (AKEDEM) for generating self-reliant development in Africa.

Keywords: Restructuring, Construction Industry, Built Environment, Polycentric Planning, Africa

INTRODUCTION

Rethinking and restructuring the Construction Industry and the Built Environment (CIBE) in Africa is inevitable due to some factors that affect the CIBE in the continent. The factors include: (1) low local content, (2) low involvement of African expertise, (3) low or lack of machines and equipment produced in Africa, (4) local materials are exported for imported machines and equipment, (5) environmental impact on citizens' livelihoods with low mitigation, (6) capital flight through payments to foreign expertise. In the context of this paper, restructuring is the change of mindsets of scholars, intellectuals, public officials and the people from the colonial and Western orientations towards endogenous (inward) thinking in the ways they relate with their environmental resources. The restructuring of CIBE that will enable Africans to looking inward and utilising local resources is highly imperative for Africa to make progress in all areas of life. Tocqueville (1966), identified that one of the three factors that is important in understanding how a society functions is the peculiar and accidental situation, which providences places people. This could refer to environmental and material conditions that are available to people in fashioning their lives. The type of resources within an environment, to a large extent, other things being equal, determines the fortunes of the people in that environment (Akinola, 2011b).

It is on this note that this paper argues that Africa is endowed with diverse environmental and natural resources upon which African higher institutions should base their intellectual inquiry for the application of endogenous knowledge and sustainable entrepreneurship in turning raw materials into manufacturing products rather being an importing continent.

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This is because society that pays attention to the application of endogenous knowledge makes full use of local resources and appropriates technology that produces self-reliant development and generates dignified local employment for its citizens. Construction Industry and the Built Environment (CIBE) within the context of Africa is defined as industry designed for the production of construction materials that are produced using local raw materials and the consequent built houses and infrastructure that eventually emerged. This requires appropriate technology that considers environmental health implications of processing such materials in the first place. The built environment comprises residential, industrial, commercial, public utilities, roads, rail, airport, seaport, open spaces – paved and greened, simple structures, sky scrapers, off-shore infrastructure for oil exploration, aircrafts, ships, warplanes, submarines, etc. The question is: How many of the components of the built environment are Africans producing using locally available resources?

Akinola (2007f) notes that there is a high level of dis-articulation between African governments, universities, industries and the people, which culminate into a high rate of unemployment (NGO News Africa, June 2 and 9, 2010) and food insecurity. Similarly, HERANA (2011) shows that there is clearly no articulated development model or strategy on the importance of a knowledge economy approach to development both at the national government and university level in Africa. Consequently, despite $3 billion spent on food aid for the continent annually and $33 billion in food imports, about 33% of Africans is chronically hungry (Dione 2010).

This paper found that development dilemma in Africa is predicated upon the neglect of the potentials and capabilities of endogenous knowledge tools and techniques. Unlike in Europe, America and Asia, where Knowledge Management (KM) tools have been deployed to generate development, African governments have relegated to the background the imperatives of endogenous knowledge, thus endangering gaps between knowledge and realities in the continent. These missing links have accounted for the failure of series of foreign theories, reforms, strategies, models and development programmes implemented in the continent to resolve developmental challenges, over the years. The gap created by government apathy towards knowledge application to realities needs critical analysis. The central argument is that: it is what people are doing at home that should form the basis of development in all sectors. It is not enough to learn from abroad; development cannot be imposed from above or from outside.

The paper raises some fundamental questions:

1. How can Africans mainstream indigenous and endogenous creativities into modern CIBE?
2. Are there research findings and knowledge generated on the processing of local materials into components of CIBE in African universities?
3. If they exist, what happens to the knowledge?
4. How do we translate the knowledge to reality in meeting the needs of CIBE?
5. What role should professionals in CIBE play in bridging the gaps between theory/knowledge and reality in the continent?
6. Are African universities in tandem with African governments capable of demonstrating their intellectual capability in resolving technological and industrial challenges in the continent?
7. Why should African universities and African governments continue to maintain intellectual aloofness when they are surrounded by knowledge on shelves and on streets, environmental resources that could constitute inputs into the production of components of CIBE?
8. Under what conditions can industrialists and private sector use local resources as input into production system to produce products that can be used in the development of CIBE?
9. Is technology in African cities a practice of co-creation that involves social and material aspects, and societal and development?

The point of departure of this paper, therefore, is in problem solving and solution seeking. This paper, therefore, provides results of several studies and designs models to demonstrate principles and practices needed to make polycentric environmental planning and adaptive education evolve endogenous-based development that meets African needs. Polycentric environmental planning (PEP) is the process of setting up multi-layered and multicentre institutional mechanisms for the combination of, and utilisation of endogenous knowledge, local raw materials, appropriate technology, local funding for R&D in galvanising CIBE (see 2010a:58, 2010i, 2011a:7). A

polycentric approach to development emphasizes people-centred and community-oriented development in ways that prioritize local environmental resources, endogenous knowledge, inclusiveness and popular participation. This is one of the reasons this paper is set to ensure synergetic interactions among strategic stakeholders in development – governments, universities, industrial/private sector, peasant communities.

The paper, thereafter, charts a course of action that could be taken to ensure that African scholars, African higher institutions, public officials, governments, industrial/private sector, peasant farmers and local communities become "organic" in their activities and use endogenous knowledge as agents of change to impact positively on their communities and reduce poverty. It is in the light of this exigency that this paper suggests African Polycentric Technological Development Model (APTDM) for generating technologically inclined smart community and African Endogenous Knowledge Development Model (AKEDEM) designed for generating self-reliant development in Africa.

The Problematics of Development in Construction Industry and the Built Environment (CIBE) in Africa: The IAD Perspective

Underdeveloped countries should not accept the inherited Western economic theory uncritically but remould it to fit their own problems and interests (Myrdal 1957: 99). *…no two communities are ever the same and people always bear some marks of their origin (Tocqueville, 1966). The fact that a model worked in the West does not suggest its workability elsewhere (Akinola 2008p:174).*

The theories of collective action suggest that individuals under certain institutional arrangements and shared norms are capable of organizing and sustaining cooperation that advances the common interest of the group in which they belong (E. Ostrom 1990). This is the fundamental of the Institutional Analysis and Development (IAD) framework. Since society is a system of human cooperation, people in any society should collectively relate to and deal with their exogenous variables. Exogenous variables are those conditions that affect human livelihoods and which humans have to work upon through appropriate institutional arrangements to better their conditions of existence. If we share with the collective action theories that institutions matter in terms of their influence on cooperation in utilization of knowledge and natural resources, then the problems of cost and quality of construction/building materials as well as unemployment can be addressed if appropriate institutional arrangements are put in place for synergy.

Unfortunately, knowledge application that translates natural resources to productive products and development is lacking in Africa, while extractive activities predominate in the continent (Akinola, 2010i). For instance, while innovative ideas are generated by African scholars in construction industry, there have not been sufficient incentives on the part of African governments to harness these potentials for the development of the construction industry (Fagbohun, 2005). Rather, African governments, industrialists and to certain extent, the private sector patronized imported technology and development paradigm which are usually at variance with African realities (Akinola, 2002, 2007f). The construction industry is so strategic to the general economic development of any country so much that the tempo of construction activities in any nation has been accepted worldwide as the barometer of overall development in any country (Okereke, 2006:13). In Nigeria, for example, it accounts for over 6% of the GNP, employing not less than 40% of the labour force (CBN, 2000 cited in Okereke, 2006:13).

The construction industry requires KM tools to be able to tailor locally available resources to the needs of the continent. Otherwise, resources will be exploited to the advantage of external investors and economies. This has led to the persistent exploitation and expropriation of African resources – human, natural, intellectual – within the last five decades – a situation that has engendered developmental crises. It is against this backdrop that Knowledge Management Africa (KMA) has emerged as a new initiative which recognizes knowledge as the key factor in wealth creation and production processes for Africa rebirth and renewal (DBSA 2006:ix). However, within KMA structure, the institutional mechanism and technical know-how of how to take knowledge to the streets in Africa have not been adequately developed (Akinola 2008p). This is one of the important areas this paper intends to make some contributions.

Examining the role of knowledge in economic development, the World Bank has created a Knowledge Economy Index (KEI). This benchmarks countries' performance on four pillars of the knowledge economy – (1) the favourability for knowledge development within the economic incentive and institutional regime; (2) education and training; (3) innovation and technological adoption; and (4) information and communications technology. Knowledge Economy Index (KEI) and 2009 reports show that most African governments do not put enough priority on knowledge application to real life situations that concern the welfare of their citizens and development of their societies (World Bank, 2009; Akinola, *et. al.*, 2013i).

It is apposite at this juncture to bring to the fore recent findings by Higher Education Research and Advocacy Network in Africa (HERANA) (2011) on the role of universities in economic development in eight African countries. HERANA (2011) shows that: None of the eight countries has a clearly

articulated development model or strategy per se. What these countries have are often based on "best practice" policy-borrowing from first world countries, particularly from the World Bank. This is a monumental disaster caused by Eurocentric ideology.

For example, the Israelis, though in the desert, used their culture and habits of hearts in causing agricultural revolution and now one of the outstanding agricultural innovationist across the globe. Similarly, South Korea took palm fruits from Nigeria in 1960 and now one of the leading exporters of palm oil, while Nigeria is importing palm oil. Industrial wastes from rice and timber productions have been noted for production of building materials in countries such as Thailand, Malaysia and India (Columa 1970 cited in Okereke 2006:15). Whereas studies by Nigerian scholars show that waste materials can be recycled for construction industry (Okereke and Obeng, 1985; Okereke, 1988; Edeh, *et. al.*, 2012a; Edeh, *et. al.*, 2012b), they are bunt away in Nigeria only to cause air pollution. This confirms that Nigeria is not applying knowledge generated by its scholars to solve problems of daily existence.

It is on record that civilization started in Egypt, one of the African countries. This historical fact is confirmed by the existing pyramids in Giza, Cairo, Egypt. The structures at pyramids of Giza were foremost among the wonders of the world. The complex houses the Pyramid of Khafu (230m x 146m, base and height), Pyramid of Khafe (215.5mx 143m), Pyramid of Menkare (108.5 x 66.5). The unending fascination with the Giza pyramids is due to two factors: their sheer size and the precision with which they were built. When Napoleon sat at the foot of the pyramids, he reportedly calculated that there was enough material in the three to build a wall 3 meters high and 1 meter thick around the whole of France. To appreciate the accomplishment one must remember that the Egyptians used only tools of wood, stone and copper and employed no wheeled vehicles (they adopted the war chariot only after 1750 B.C (Roth, 2007:199).

The question that borders one's mind is on the source of the technology that was used in the construction of pyramids several centuries ago. What happened to that technology? Why was it not sustained for Africa's development? It is important, however, to note that there are sundry cases of talents, innovations and inventions in science and technology that had been killed in Nigeria due to government apathy and inertia (see for details, Adeyemi 2011:22-24).

The present development dilemma in the Construction Industry and the Built Environment (CIBE) in Africa is predicated upon the problems of disconnect and "parallelism" that separate the peoples of Africa from their leaders. As a result, policies adopted since political independence have reinforced the state institutional character and its inability to progressively enhance the environmental conditions and living standards of majority of the African population. The elite are alienated in terms of the educational curriculum introduced by the colonial governments. The curriculum did not pay much attention to the study of African culture, its roots and adaptive education that can help the society to release the potentials and capabilities of the people. This problem still persists till today as higher institutions in the continent only train students for white collar jobs instead of creating jobs using local resources.

Opportunities to reduce cost in CIBE are not harnessed due to inertia and lack of vision on the part of African governments. For instance, several innovations on recycling of asphalt and use of waste materials for construction materials are not prioritized (Ola, 1983; Schroeder, 1994; Osinubi, 2000; Osinubi, *et al.*, 2009; Osinubi and Edeh, 2011; Edeh, *et. al.*, 2012a; Edeh, *et. al.*, 2012b). Examples of creative innovations from Nigeria that can be replicated to enhance the development of the construction sector abound. Scholars in the Department of Civil Engineering, Ahmadu Bello University, Zaria and University of Agriculture, Makurdi, Nigeria evaluated the characteristics of palm kernel shell ash (PKSA) stabilized reclaimed asphalt pavement (RAP) and found that 90%RAP/10%PKSA mix can be used as sub-grade material in flexible pavements. This saves cost as recycling of asphalt pavements is a beneficial approach from technical, environmental and economic perspectives. The use of stabilized RAP as sub base and base materials of pavement leads not only to economic solution but also offers a potential use of the RAP treated with cemented materials like sawdust ash, thus reducing the amount of waste materials requiring disposal and providing construction materials with significant savings over new materials (Edeh et. al., 2012a; Edeh, et. al., 2012b).

The built environment in Africa, especially markets where food items are sold are not hygienic during the rainy season. Transactions take place in muddy environment to the extent that there are feet washers who carry water, soap, and towels around in place like Lagos, Ibadan in Nigeria; Nairobi, Mombasa in Kenya; Kumasi, Tamale in Ghana, etc. Whereas, abundant raw materials exist to transform such commercial areas into healthy environment, African governments are not interested in utilising these materials into products for the benefit of the citizenry.

THEORETICAL UNDERPINNING

In order to contextualise the line of analysis in this paper, polycentric planning, an off-shoot of the Institutional Analysis and Development (IAD) framework is adopted. Institutional analysis helps us to better understand how individuals within communities, organizations and societies craft rules and organize the rule-ordered relationships in which they live their lives (Ostrom, 1990; Sawyer, 2005:3). Polycentric planning recognizes the fundamental defects in the centralist model of planning and the persistence failure of the state to meet the collective yearnings and aspirations of the citizenry. As a result, polycentric planning has called attention to the self organising capabilities of the people that are rooted in collective action at community level (Akinola, 2010a, 2011a). This line of thought recognizes that human beings can plan, organize and govern themselves based on appropriate institutional arrangements and mutual agreements in a shared community of understanding. The IAD believes in institutional arrangement designed by people who cooperate based on rules and constitution of their choice, and thereby are able to resolve socio-economic and techno-political problems which other people (external to their conditions) are not capable of doing for them.

The IAD framework is very useful to appropriating technological devices towards environmentalism, developmental drives, industrial processes, human development and sustainable development. The questions this paper raises border on how the stakeholders are interacting on utilization of environmental resources, endogenous knowledge, industrialization and local economic development. However, there are some fundamental imperatives of collective action within development arena. These are collegiality, mutual trust, reciprocity and shared community of understanding. The realisation of these imperatives through effective planning and institutional arrangements can enable stakeholders in CIBE to work together so as to achieve efficient and sustainable development in CIBE (Akinola, *et. al.*, 2013i).

Studies have confirmed that local peoples in Africa engage in myriads of socio-economic and political activities which constitute the drivers of development but, unfortunately, they are neither properly documented nor recognized by official statistics in Africa. In spite of the robustness and resilience of African endogenous knowledge in crafting people-centred institutions, these potentials are excluded by African elite and educational curriculum (Akinola, 2010i). As a result, previous theories, models and strategies failed in Africa because they were designed by foreigners whose backgrounds and institutions were external to African realities in all ramifications. Such impositions of foreign ideas and the absence of appropriate mediums of dialogue, knowledge and use of tools, either in relation to content, artifacts or vehicles of communication have tended to weaken and denigrate African institutions (Olowu, 1999, 2006; Ayo, 2002; Sawyer, 2005). These are fundamental issues that are affecting the potential effectiveness of all development programmes in Africa.

For models to respond to realities, people-oriented institutions and cultural traits of the people should constitute their essential components. It is the needs of the people within their environmental, socio-economic, technological and cultural contexts that should determine the contents of curriculum in higher education programme. This requires breaking the limits by scholars on knowledge application to utilizing environmental resources for developmental purpose.

Knowledge Generation and African Developmental Capabilities

People can best develop from the foundations of their indigenous knowledge which is embedded in the culture of the people. Development cannot be imposed from outside, it has to proceed from within. History has taught us that the most successful cures for poverty come from within (Landes, 2000; Prah, 2002).

Examples of creative innovations from Nigeria that can be replicated to enhance the development of the construction sector abound: For example, scholars at the Department of Civil Engineering, Universities of Ibadan and Lagos, Nigeria have come out with series of innovative works on: (a) The use of Palm Kernel Shell, Sawdust and Rice Husk Ash as partial/full replacement for gravel sand and cement in concrete (Olutoge, 2009, 2010); (b) Structural characteristics of Bamboo (Bambusa Vulgaris) as reinforcement in concrete slabs (Alade & Olutoge, 2004; Alade & Olutoge, 2004; Alade, Olutoge & Alade, 2004); (c) The Production of concrete using Rice Husk Ash as a partial substitute for cement and palm kernel shell and sawdust as partial/full substitute for fine and course aggregates (Olutoge, 2009, 2010).

Scholars in the Department of Civil Engineering, Ahmadu Bello University, Zaria, Nigeria established that Bitumen-Makuba stabilized soil blocks are strong and durable and are more economical than the conventional sandcrete hollow blocks (Salisu and Jibrin, 2011). Similarly, scholars in the Department of Mechanical Engineering in University of Lagos, Nigeria designed a pyrolysis reactor for the treatment of municipal solid waste and for resource recovery. The machine has the potential to achieve a waste volume reduction of about 65% (Ojolo and Bamgboye, 2005). At the Ladoke Akintola University of Technology, Ogbomosho, Nigeria, laboratory scale quantities of palm kernel oil (PKO) biodiesel were produced through transesterification process using 100g

PKO, 20.0% ethanol (wt% PKO), 1.0% potassium hydroxide (KOH) catalyst at 60^{o}C reaction temperature and 90 min. reaction time (Alamu, 2007).

Local people in Saki, Oke-Ogun area of Oyo State in Nigeria are transforming inherited indigenous knowledge (blacksmiths) to intermediate-technology – iron-smelters, iron-benders and welders for construction works (Akinola, 2007f:229). The Burnt Bricks Association, an indigenous occupational institution in Makurdi, Benue State, Nigeria is another example of local technology that has potential for the development of the construction sector. The enterprise constitutes the engine of industrial growth in Benue State as the products are stronger, more durable, readily available, cheaper and cooler than the regular cement blocks. This provides employment opportunities and mobilises small savings in the economy for industrial growth, thus making government to grant the association tax concessions (Agbo, 2003).

In spite of the relevance of the intermediate-technology, there has been virtually no attempt by the Nigerian government to establish small scale industries where adapted technological skills can be used in the construction/building industry. Government fails to encourage the industrial production of machines and equipment; hence did not go beyond prototype. As a result, the opportunity to produce better models for the establishment of sustainable industrialization for absorbing labour had been lost, while the innovations had ended up as artifacts. Consequently, Nigerian/African universities have become the cradle and graveyard for many innovations and inventions that could not go beyond prototypes (Adeyemi, 2011:22-24). The ideal thing is to empower these local innovators so that their skills and potentials can be harnessed towards national and continental development. Yet vast local materials and resources are wasted because appropriate technologies for processing materials are not made available.

The realization that wind energy is low cost has prompted William Kamkwamba, from Malawi, a born inventor, who at the age of 14, built an electricity-producing windmill from spare parts and scrap. The windmill he built powers four lights and two radios in his family home (Africa Focus 2009b).

If civilization started in Egypt, which is correct, the question we should be asking is: What actually went wrong with us in Africa? What type of technology did Egyptians used in the construction of pyramids such that these structures exist till today? (Plate 1). When one considers the height of the researcher in relation to the height of the blocks, one can imagine the type of technology the Egyptians used in the construction of the pyramids (Plate 2).

Plate 1: Picture of Pyramids in Cairo, Egypt with Researcher in suit in the middle
Source: Akinola, et. al., (2013i).

Plate 2: Picture of Pyramids in Cairo, Egypt with Researcher standing beside the blocks.
Source: Akinola, et. al., (2013i).

The above cases confirm that these innovations and knowledge generated on the processing of raw materials to building/construction materials are not utilized to address real life situations in Nigeria and other African countries. They only exist as an end instead of as a means to an end in developing

African economy. Thus, the discussions, so far, have clearly demonstrated the missing links between and among the stakeholders in CIBE. The next section discusses the way forward on endogenous knowledge and problem-solving entrepreneurship in Africa

Endogenous Knowledge and Problem-Solving Entrepreneurship in Africa

The type of resources within an environment, to a large extent, other things being equal, determines the fortunes of the people in that environment (Akinola, 2011b).

The Challenge on African Scholars and Universities

Given the peculiar conditions of development in Africa, scholars should devise means of resolving the complex and hydra-headed problems in the continent. What is required is that African scholars should go the extra mile in applying knowledge to the recurrent challenges – taking theories to the streets. In my own view, the challenges in Africa constitute an acid test of Africans capability in resolving the challenges facing the continent. The question is: How capable are Africans to resolve their internal developmental challenges without recourse to external assistance? The 13 questions raised in the introduction of this paper need to be answered. It is on the possible answers to the 13 questions that this paper argues that it is possible for Africans to use their entrepreneurship and work together as colleagues with equal standing within development arenas to redeem the continent from the clutch of Western hegemony and liberate the people from poverty and oppression.

According to Einstein's famous statement that captures this dead end: "You can't solve a problem by using the same kind of thinking that created the problem." There is, in effect, a bankruptcy of ideas. This presents us with an opportunity (Cited in Manji, July 2011). African scholars and universities should take decisive steps at bridging the gaps in all fronts. Linking the work of the university to the needs and requirements of the state is viewed by some as a pre-condition for the technological survival of nations. This will serve as an alternative means of using endogenous knowledge-based economy to initiate African socio-economic, techno-political and environmental rebirth and renewal for African development.

According to World Prout Assembly (2005), endogenous knowledge makes people look inward and make full use of local resources through collective ownership of the means of production to achieve profits and reinvests surpluses for generating dignified local employment. Endogenous development model condemns the traditional economic model that focuses on independent accumulation of wealth, noting that wealth in Africa has traditionally been concentrated in the hands of few Africans and foreign investors. As an alternative, endogenous development, or internally directed development focuses on regional development, which incorporates humanistic values into the economic system and provides a democratic distribution of wealth.

This paper, thus, charts a possible course of action that can be taken at resolving African development dilemma through endogenous knowledge and problem-solving entrepreneurship in CIBE. In this wise, African Polycentric Technological Development Model (APTDM) for generating technologically inclined smart community and African Endogenous Knowledge Development Model (AKEDEM) for generating self-reliant development in Africa are designed to addressing challenges in CIBE in Africa.

African Polycentric Technological Development Model (APTDM)

African Polycentric Technological Development Model (APTDM) (1a-b) is designed for the setting up of multi-layered and multi-centred institution mechanisms for the establishment of co-creation of materials and social conditions for the production of end products – machines, equipment, tools, etc. towards energy saving, environmental friendliness and cheaper goods and services for driving GDP. APTDM is also designed for generating technologically inclined smart community and self-reliant development in Africa (Akinola, 2017f). It derives inspirations from AERM, AIGMM and AKEDEM (Akinola 2010f, 2011j). It is conceptualised as home-grown technology or appropriate technology, which is a practice of *co-creation* involving social and material aspects, social and natural sciences, and societal and technological developments.

The first part of African Polycentric Technological Development Model (APTDM) is displayed in

Fig. 1a showing African indigenous technology potentials and future prospects. Africans in various ecological and cultural settings were full of ingenious and creative manufacturing of farming implements, hunting devices (traps), warfare weapons (guns), etc.; and manufacturing of equipment for harvesting, crop processing, crop storage, etc. that reflected co-creation between social and materials, natural sciences, societal conditions and technological developments. Unfortunately, these prospects were truncated by colonial ideological frameworks.

Though the colonial mentality predominated, the denigration/suffocation of indigenous technology was partly due to inferiority complex on the part of the local people who felt that the elite knew better. On the part of the elite, however, the denigration/suffocation of indigenous technology was due to arrogance, ostentatious demonstration of half-baked educational system. Instead of looking inward and see themselves as a people different from the white, they embarked on wanton technology

consumption to show off in their local communities as new arrivals. Consequently, governments, university/polytechnic, private/industrial sector became aggrandized and adopted technology that they could not maintain. On the other hand, peasant farmers, artisans and communities engaged in adaptation strategies which they sustained till date. A good example is Saki initiatives in iron and aluminium industry in Oke Ogun, Oyo State, Nigeria.

Unfortunately, the technology illusionary syndrome generated technology deficits for African economy as imported machines and equipment did not reflect co-creation between materials and social conditions. There was general high cost of production with attendant high cost of living. Realising the technology evil the White had plunged Africa into, the equation of the game changed to technology transfer deception and international conspiracy. Machines and equipment that were imported to Africa were not accompanied with spare parts, while expertise was imported at exorbitant cost to African economy. For example, Nigeria spent over ₦722bn ($2bn) annually to import technical expertise for maintenance of aircraft, spare parts, emoluments, etc. (*The Punch*, Wednesday, Sept., 6, 2017, p. 35). The same pattern exists with the Ajaokuta Iron and Steel industry that remains as Elephant project in Nigeria.

This, invariably, leads to infrastructural deficits, debts and poverty as high costs of construction and maintenance of roads, education, health, water, electricity, etc. gulped the lion share of budgets of African governments. The fact that machines and equipment have to be imported give rooms for inflation of contracts and double award of contracts by corrupt African leaders with their international collaborators and dubious multinational companies.

In order to address this problem, the solution zone engages on the way forward by adopting African Endogenous Knowledge Development Model (AKEDEM). Like African Education Reform Model (AERM) (Akinola 2010f), AKEDEM identifies the missing link in African educational system, especially, both at the university and governmental levels. The university system trained scholars to generate knowledge alone; while expatriates were heavily relied upon by African governments. Since expatriates did(do) not understand African realities, reliance on them did(do) not yield positive results as exogenous informed development paradigms were derived from developed societies where formal sector predominates. These models and strategies did (do) not work in Africa where informal sector accounts for about 70% of the population.

This missing link calls for a rethink and paradigm shift in the orientations of both scholars and public officials in Africa. It is in the light of this exigency that African Endogenous Knowledge Development Model (AKEDEM) is designed. The model suggests that scholars and public officials should work together when there is a problem to resolve rather than apportion blame when things have gone wrong.

Scholars from various disciplines (humanities, social sciences, sciences and engineering) should engage in philosophical thinking research on African development viewing African realities from exogenous variables. For example, scholars in social sciences and humanities should focus on biophysical/material conditions, cultural and other attributes of a community, and rules-in-use. The outcome of their efforts will determine institutional arrangements that favour cooperation among workers in organisations (public and private) including firms and industry. Similarly, scholars in sciences and engineering should focus their research on biophysical/material condition and their usage in relation to culture of the people. The outcome of their efforts will determine technology for extraction, processing and storage of products.

AKEDEM conceptualizes knowledge system as knowledge creation that consists of three major types of knowledge or research that exists and can be used in addressing specific problems (Haynes 2001; Graham, et. al. 2006:18). The three types are: knowledge inquiry, knowledge synthesis and knowledge tools or products. Armed with sundry questions (see Figs. 1b & 2) (listed below), African scholars and public officials should view African realities with intellectual lenses through exogenous variables – biophysical/material conditions, cultural and other attributes of a community, and rules-in-use (Akinola 2007f; 2008p. Such questions include:

1. How are people navigating the crisis in food production and feeding, security, housing, healthcare, clothing, education, transport, security, etc. that confronts Africa?
2. What is(are) the source(s) of initiatives for resolving challenges and crisis?
3. How are rules being used by local people and their institutions crafted and modified?
4. What kind of incentives favour trusted institutional arrangement among the people?
5. What lessons can be learnt from peoples' creativities and adaptive strategies they evolved over the years in addressing problems of daily existence?
6. What lessons can we learn from endogenous impulses that people use to address problems of daily existence?
7. How can Africans mainstream indigenous and endogenous creativities into modern industrial agenda?

According to Fig. 1b, possible answers to the sundry questions will be transposed into institutional mechanisms, arrangements, models and strategies to resolving challenges and problems confronting Africa. Endogenous knowledge tools/products that emerge will pass through appropriate channels of communication to the stakeholders and end users using traducture as a method during implementation. It is at this stage that AIC which houses ADBB can carry out the responsibility of experimenting knowledge application as diagrammatized in Fig. 3.

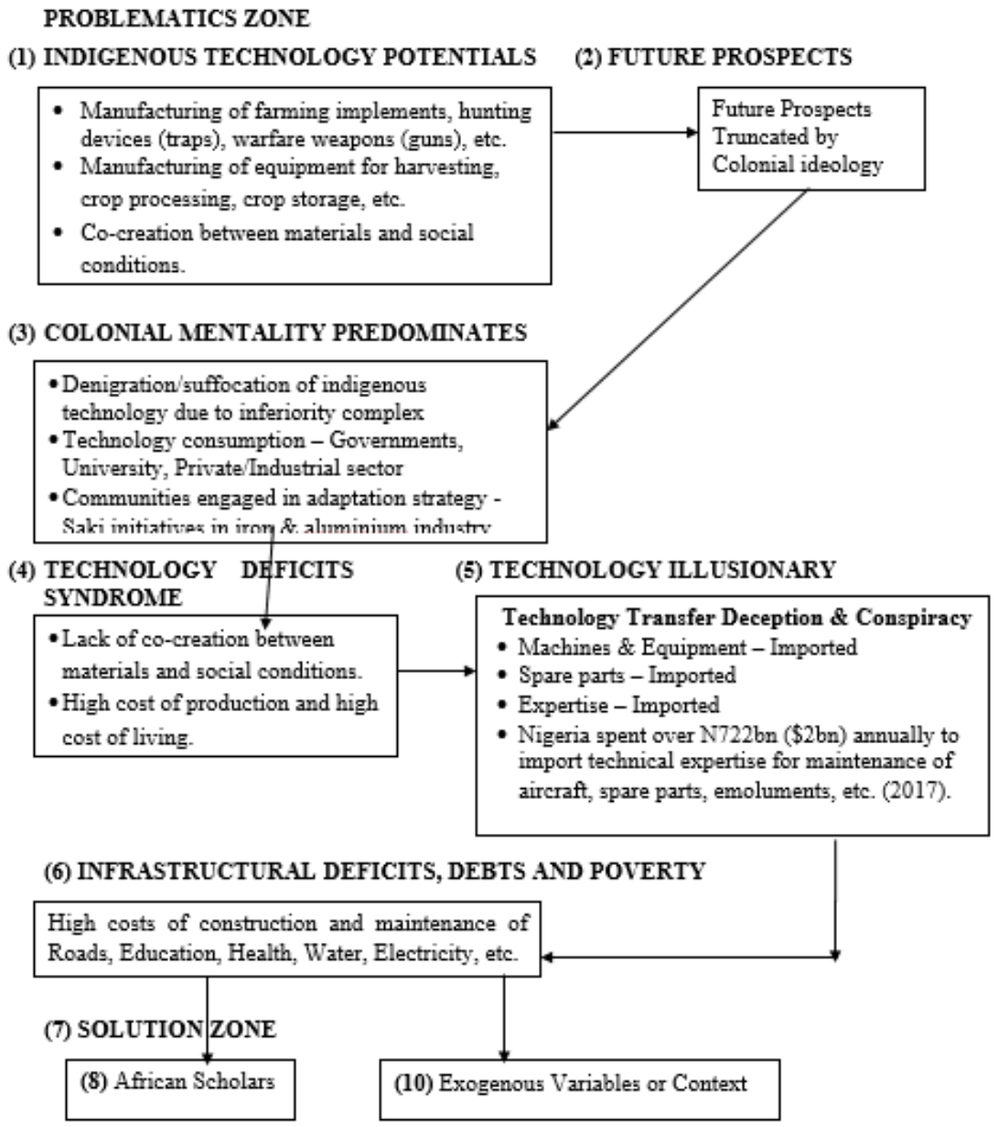

Fig. 1a: African Polycentric Technological Development Model (APTDM)
Source: Adapted from E. Ostrom, Gardner and Walker (1994:37); Graham, et. al. (2006); Akinola (2007f:231; 2008p:188; 2010i:53; 2011a:44).

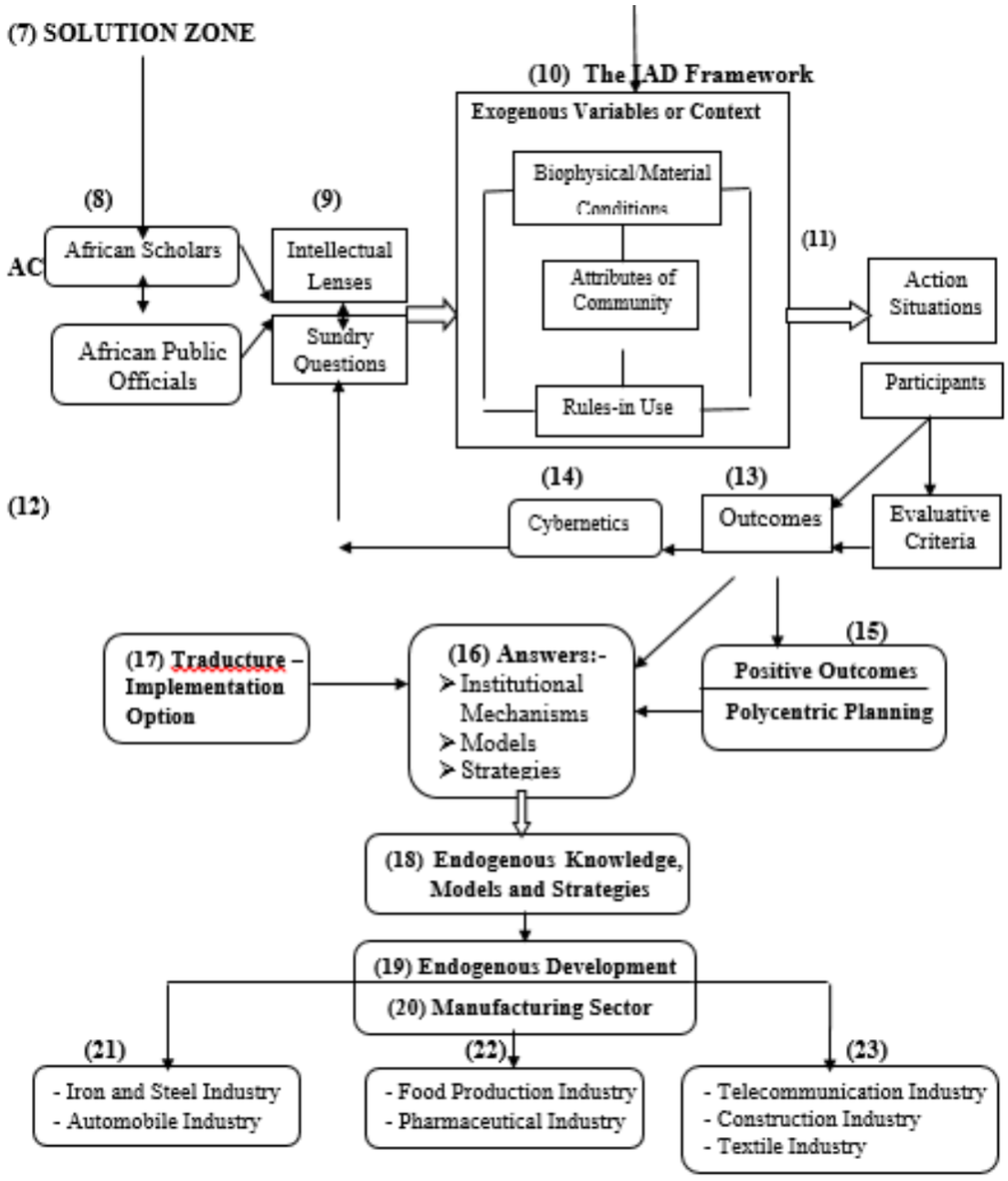

Fig. 1b: (Fig. 1a conts.): African Polycentric Technological Development Model (APTDM)
Source: Adapted from E. Ostrom, Gardner and Walker (1994:37); Graham, et. al. (2006); Akinola (2007f:231; 2008p:188; 2010i:53; 2011a:44).

African Endogenous Knowledge Development Model (AKEDEM)

African Endogenous Knowledge Development Model (AKEDEM) (Fig. 2) is designed for solving problems and generating self-reliant development in Africa. This becomes necessary in the light of attendant effects of colonial intellectual syndrome that relies on exogenous development paradigm with its consequence of intellectual poverty and development dilemma in Africa.

Like African Education Reform Model (AERM) (Akinola 2010f), AKEDEM identifies the missing link in African educational system, especially, both at the university and governmental levels. While expatriates were (are) heavily relied upon by African governments, they (expatriates) did (do) not understand African realities, hence the failure of imported development paradigms. This failure calls for a rethink and paradigm shift in the orientations of both scholars and public officials in Africa. It is in the light of this exigency that AKEDEM suggests that scholars and public officials should work together when there is a problem to resolve rather than apportion blame when things have gone wrong.

The outcome of intellectual inquiry will produce knowledge that reflects African realities. This is knowledge creation. As knowledge moves through the funnel, it is filtered; it becomes more distilled and refined. In the end, only the most valid and useful knowledge is left and presumably more useful to stakeholders (Graham, et. al. 2006:18). At each phase of knowledge creation, knowledge producers can tailor their activities to the needs of potential users. They can tailor their research questions to address the problems identified by users. When the results are available, they can tailor or customize the message for the different intended users (e.g., repackage their products for specific user audiences: the public, practitioners, policymakers).

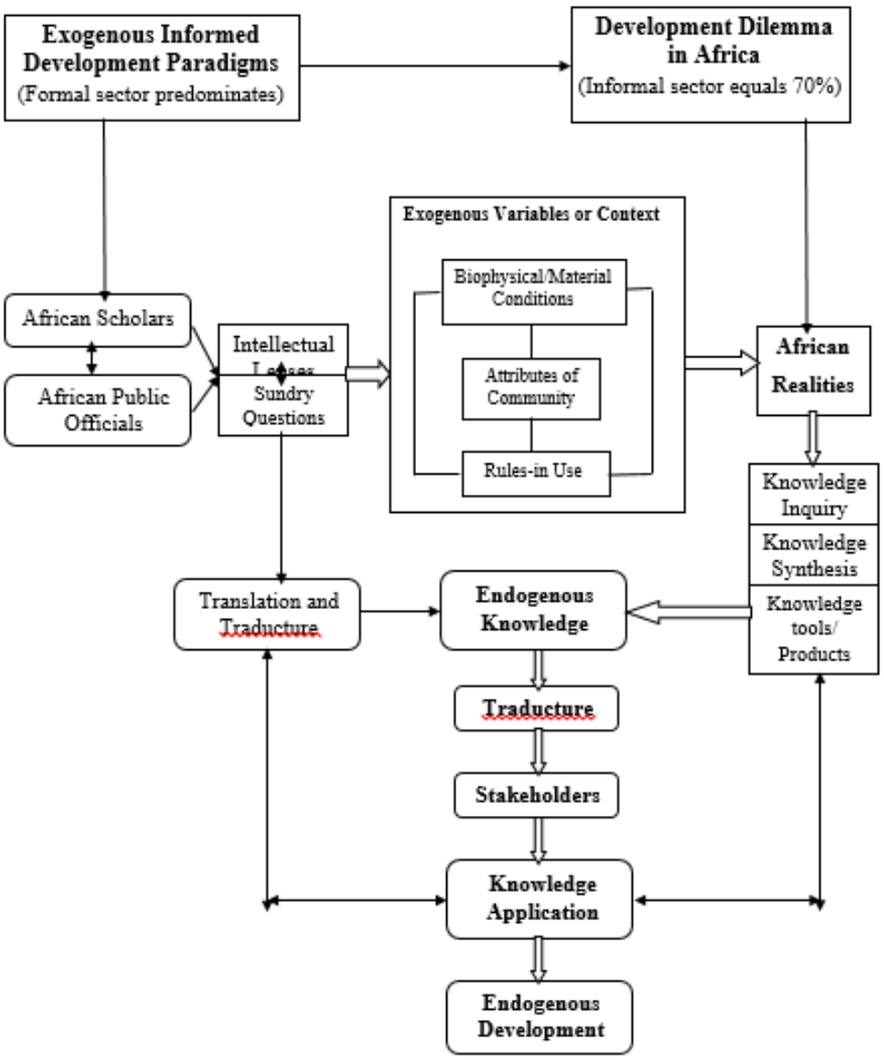

Fig. 2: African Endogenous Knowledge Development Model (AKEDEM)
Source: Adapted from E. Ostrom, Gardner and Walker (1994:37); Graham, et. al. (2006); Akinola (2007f:231; 2008p:188; 2010i:53; 2011a).

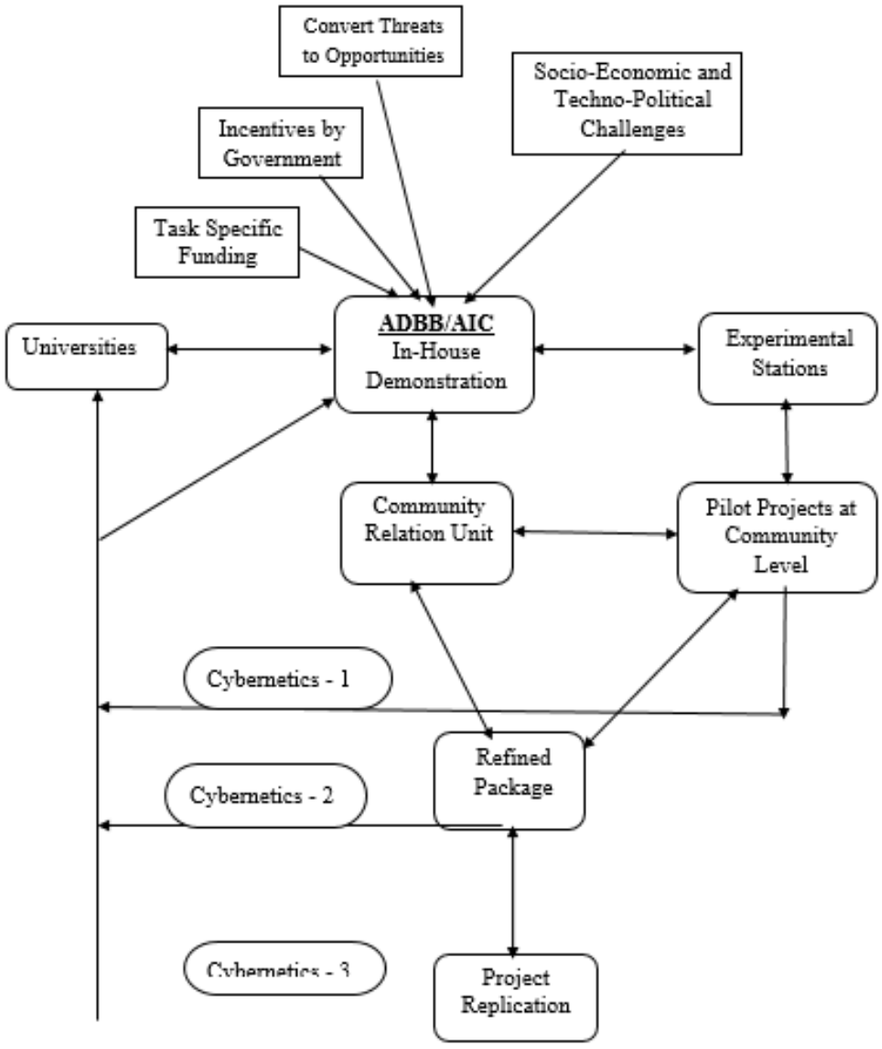

Fig. 3: African Education Reform Model (AERM): Showing the Illustration of the Mechanism of ADBB/AIC in taking theories to African Streets.
Source: Adapted from Akinola (2008p:187, 2010f; 2010i:51).

From Fig. 3, the resultant effect of both African Education Reform Mechanism and African Development Institutional Mechanism (ADIM) is that enabling environment for the key stakeholders in development – governments and universities (see Akinola, 2007f, 2008p) makes the conversion of threats between the two groups to become possible. African Development Institutional Mechanism Model (ADIM) ensures that both African public officials and African scholars develop smooth working relations. With innovation coming from scholars and robust institutional arrangements, it will be easier for government to increase its presence and relevance at the community level. Training programmes in ministries of agriculture, works, health, education, etc., should be executed in the field, in conjunction with working associations on the ground.

According to Fig. 3, African scholars pass knowledge to African Development Brain-Box (ADBB) (Akinola 2008p:186-187; 2010i) where knowledge will be assessed on its strength to resolve specific problem. If the model is found to be good, then it will be experimented at the field. Universities, being in close contact with governments, should through its adaptive research, discover the needs of the society, develop new ideas and innovations and send them to ADBB, which is housed by African Innovation Center (AIC) that plays moderating influence for knowledge utilization. As shown in Fig. 3, it is ADBB/AIC that will adapt knowledge to reality through its experimental stations and pilot projects for every sector of African economy – social, economic, technological, and political spheres. AIC will have strong community relations such that any innovation coming to it will be quickly fixed up in relevant or demand communities where the idea is needed and can be demonstrated as pilot project.

After the pilot project, there is the need for feedback, called cybernetics which will occur at three levels as shown in Fig. 3. The feedback on the performance of pilot project will be sent to ADBB, which will lead to the refining of the model/package that will be demonstrated again at the field. The performance of the model shall be evaluated and the report sent to ADBB for further refinement.

The application of such knowledge to the CIBE will produce policy frameworks in several areas such as:

(1) Percentages of local content in all machines, equipment and products in CIBE.

(2) Percentages of land used for buildings, structures and paved open space and green open space.

(3) Percentage of wetlands in relation to built spaces in cities.

(4) Percentage of wetlands in relation to space devoted to urban agriculture.

(5) Appropriate area and space devoted to city expansion and development beyond which further development is prohibited. This principle supported development of new towns and satellite towns to prevent city congestion.

CONCLUSION

This paper concludes that the high level of dis-articulations between the stakeholders – African governments, universities, industries, private sector and realities at local communities – have culminated into a high rate of underdevelopment in the construction industry and the built environment. This is because there are gaps between the stakeholders in the sense that endogenous knowledge is not properly utilized to transform local raw materials into construction materials. This, invariably, places African countries as technology consumers rather than producers, thus, making them vulnerable to external shocks. The wisdom of the logic of polycentric environmental planning process demands utilization of local knowledge and environmental resources to resolving identified problems in construction industry and the built environment.

This paper posits that African scholars and intellectuals should critically study indigenous and endogenous impulses that the people of Africa are exploiting in surmounting their daily challenges. These, however, should be analysed in the light of exogenous variables-development process and methods. Findings and experiences gathered from these exercises, including experiments, would invariably, be useful to designing African models and development strategies and also to reforming African educational curriculum. This would form the foundation upon which Africentric development would be built. The required thing is that scholars should show the way forward by becoming pragmatic in their intellectual pursuits.

This paper, therefore, calls for restructuring of intellectual mentality as well as institutional mechanisms that shape CIBE through polycentric environmental planning. African governments should engineer appropriate technology towards the utilisation of locally available materials – iron ore, limestone, bitumen, timber, etc. The paper charts a course of action that could be taken to ensure that African scholars and African universities become "organic" in their activities and use endogenous knowledge as agents of change to impact positively on CIBE. Using polycentric environmental planning, this paper designs African Polycentric Technological Development Model (APTDM) for generating technologically inclined smart community and African Endogenous Knowledge Development Model (AKEDEM) for generating self-reliant development in Africa.

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PERCEPTION OF DRUG ABUSE ON PRODUCTIVITY OF CONSTRUCTION SITE WORKERS IN MINNA, NIGER STATE.

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The prevalence of drug and alcohol abuse globally has become a matter of concern to organisations globally. Organisations such as construction industries constitute the majority of work-related drug abusers worldwide. These drugs when misused or abused could bring about adverse psychological and behavioural changes that hampered productivity on sites. This research aims to investigate the perception of drug abuse on the productivity of construction site workers in Minna, Niger state. A quantitative research approach was adopted for the study through a self-administered structured questionnaire. The data gotten were analysed using descriptive statistics which included frequencies, percentages, mean item scores, relative important index (RII) and graphical presentations. Findings from the study revealed that the most negative effect of drug abuse on construction sites which plays a negative impact on workers' productivity are workers inability to follow instructions, carelessness, violence on sites and friction among workers with mean scores of 3.84, 3.80, 3.55 and 3.53 respectively. The study also discovered that very little attention is given by the construction industry (regarding employee drug testing, the setting of anti-drug policy and awareness programme) to curb drug abuse on site. Based on these findings, the paper recommended that anti-drug policies should be set up and enforced on sites. Additionally, the industry should constantly create awareness about the negative impact of drug abuse on the users with a bid to foster labour productivity on construction sites.

Keywords: Drug abuse, labour, productivity, construction sites, site workers

INTRODUCTION

The current trend in the abuse of drug and alcohol all over the world is at an alarming and worrisome rate virtually in all industries. This scenario is of great concern most especially in the construction industry compared to other industries owing to the vast workers engaged on construction sites (Evans 2014; Frone, 2006; Whirwind Team, 2016). Plants and herbs have found useful applications to human health and well-being. However, many people have explored their negative and harmful properties to damaging use (Falco 1998, as cited by Sambo, 2008).This abuse can cause serious damages to the psychological reasoning of the abuser and the environment he relates with (Sambo, 2008). Work activity on construction site has been termed hazardous, and many workers resort to the use of drugs as a stimulant to meet up with the challenges of the sites work. Nevertheless, the number of accidents that occurs at the various phase of construction work especially when working at height, using hazardous equipment, and operating heavy equipment are obviously numerous when substance abuse, whether it be alcohol, illicit drugs (Whirlwind Team, 2016). This is because the nature of the construction work demands that employees depend on the competence of the entire team to work safely.

Hence employees are exposed to harm from the actions of their team members and themselves. However when a worker is into drugs abuse while on the job, that competence is gone, and this may affect the entire team productivity (Evans, 2014; Whirlwind Team, 2016). Although Nigeria's research into their usage in the construction industry is limited, international researchers have been able to prove that it is an on-going problem, and Nigeria construction industry faces the same challenges (Evans, 2014).

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A nationwide survey on 300 human resource professionals conducted by Hazelden (2007) discovered that substance misuse was one of the key issues they faced in the area of workforce coordination, with consequences related to absenteeism, reduced productivity and a negative impact on the names of their construction company's reputation. (Frone, 2004) Postulated that the use of alcohol and other drugs in the workforce represents an essential social policy issue for the reason that it may emasculate productivity, safety and the overall health of the employee and these outcomes could reduce an employer's aptitude to compete effectively in the industry. The outcome of the pilot study conducted by members of the Master Builders and Allied Trades' Association (Cape Peninsula) disclosed that drug and other material misapplication is dominant to a larger degree in the construction industry (Smallwood, 1998; Whirlwind Team, 2016). Ames and Bennett, (2011) revealed from the research carried out in the USA regarding drug abuse in the place of work that 15.9% of full-time construction workers aged between 18 to 64 had used illicit drugs in the month prior to when they were surveyed. Furthermore, the construction industry was ranked highest on the list out of nineteen industries that were surveyed for the adverse use of illicit drugs during work (Ames and Bennett, 2011). Feeney (2012) mentions a study conducted among construction workers in Brisbane, Australia, which found out that 50% of the workers surveyed consumed alcohol at 'hazardous' levels, and a further 15% were at significant risk of harm. More than 30% of respondents had used ecstasy or methamphetamine-type substance in the past year, while about 16% had also used cannabis during the same period.

OSHA reports as cited by Wesch (2016) disclosed that almost 18 percent of all private industry fatalities in 2011 were in the construction field. The most common causes of fatalities in the industry included falls, being struck by an object, being trapped between objects and electrocution. Putting forward an intervening measure that may involve personally approaching the drug abusers, may seem as interfering with their privacy (Master Builders Queensland construction policy director cited in Feeney, 2012). Employee drug abuse results in increased costs for employers and organisations who suffer hugely as a result thereof. Employers have to endure higher healthcare expenses for injuries, reduced productivity and performance, increased absenteeism, a greater number of workers' compensation claims, higher rates of employee turnover and H&S and other associated risks. It is not the only financial hardship that organisations have to endure; often an organisation's reputation and public image can also be adversely affected (NBGH, 2009; Evans, 2014). The problem the research attempts to solve involves finding out the extent to which abuse of drugs and alcohol has affected the productivity/output of construction workers within construction sites in Minna, Niger State, Nigeria. The aim of this research is to investigate the perception of drug abuse on the productivity of construction site workers in Minna, Niger state.

The objectives to realise the aim are outlined below:

1. To determine the extent to which construction organisations experience difficulties as a result of drug abuse in Minna.
2. To determine the probable reasons responsible for the misuse of drugs and alcohol by workers in the construction industry.
3. To determine the effects of drug abuse on labour productivity on construction sites in Minna
4. To identify the measures put in place by the construction firms in Minna to mitigate drug abuse on sites.

Prevalence of Drug Abuse on Construction Sites

The construction industry has a high rate of worker drug abuse, not only in Nigeria but also across the world. Statistics which relate to drug abuse in the construction industry are not readily available in Nigeria, however international research has proven that it is an on-going problem(Evans, 2014), and Nigeria faces the same problems relating to it. Even though not as prevalent as alcohol abuse, drug abuse is an issue that continues to remain a problem (Evans, 2014). Workers in the construction industry report higher than average rates of at-risk drug use. A large cohort study conducted in the USA between 1989 and 1998, discovered that 6.6% of the workers had received a substance abuse related diagnosis (Alberta Health Services, 2010). People in construction have higher rates of substance use and related disorders than persons in other industries: 16% with past month heavy alcohol use, 14% with past-month illicit drug use, 16% with past-year alcohol abuse or dependence, and 5% with past-year illicit drug abuse or dependence (Ramchand *et al*., 2009 and Alberta Health Services, 2010). Ames and Bennett (2011) disclosed that a study conducted in the USA regarding worker drug abuse revealed that 15.9% of construction workers aged 18-64 who are full-time employed had used illicit drugs in the month before being surveyed. Furthermore, a different nationwide survey piloted in 2012 established an occurrence of epoch use of 7% for cannabis and 4% for cocaine. The findings also proved that the lifetime prevalence was more among construction workers. This higher statistics may be meaningfully associated with the occurrence of consistent use, which can advance to continual and lifelong use. Nonetheless, the sequence of development followed in

involvements with drugs is unidentified; signifying that energetic prevention when drug use is instigated may be the only real means of avoidance (Milanés and Gómez-Bustamente, 2012). The construction industry placed highest on the list out of nineteen industries that were surveyed. The construction industry ranked higher than industries such as 'Arts, entertainment, and recreation'; 'Mining' and 'Accommodation and food services' (SAMHSA, 2012 cited in Hazelden, 2012).

Problems Arising From Worker Drug Abuse in The Construction Industry

The abuse of Drugs is a major influencing factor to the rampant occurrence of accidents within the workplace in the construction industry (Evans, 2014). According to Smallwood (1998), drug abuse impairs workers' mental, emotional and physical state which is reflected by high absenteeism, decreased productivity, re-work and high levels of both fatal and non-fatal injuries. It was also discovered that crime and violence in the workplace are often heightened by drug abuse. Hence it is not out of place to infer that, where there is drug abuse in the workplace the chance of employee theft increases and there is a greater chance of workplace violence occurring (GVK, 2014; Chandler, 2014). Worker substance abuse increases costs for employers as a result of decreased productivity, re-work, higher rates of employee turnover and increased workers' compensation and disability claims (Chandler, 2014; Alberta Health Services, 2010; NBGH, 2009; Smallwood, 1998). Breugem *et al*. (2006) reported that one of the most important factors to explore when examining the issue of drug-related harm in workplaces is the relationship between consumption and impairment. It does not necessarily follow that a person is impaired simply because of consumption of alcohol or other drugs. A range of factors must be taken into consideration, including patterns of consumption and the relative effects of consumption on the workplace.

Causes of Drug Abuse

Haladu (2003) gave the following as the main causes for the abuse of drugs as Experimental Curiosity, Peer Group Influence, Lack of supervision and counselling, Personality Problems due to socio-Economic Conditions, The need for energy to work for long hours, Availability of the drugs, and the need to prevent the occurrence of withdrawal symptoms: If a drug is stopped, the user experiences what is termed "withdrawal symptoms". Pain, anxiety, excessive sweating and shaking characterise such symptoms. The inability of the drug user to tolerate the symptoms motivates him to continue with the drug (Ige, 2000).

Effects of Drug Abuse on Workers on Construction Sites

Based on reports from Alberta Health Services (2010), Twenty percent of all work-related injuries occur in the construction industry. Construction workers experience a higher risk of disability than the general workforce. Breugem *et al*. (2006) stated that alcohol and another drug-related harm in the workplace could manifest regarding physical harms, i.e. injuries and fatalities. In Australia, between 3 and 11% of workplace injuries and 4% of work-related deaths involve alcohol; other drugs contribute to 2% of work-related deaths. In total, it is believed that substance abuse is a contributing factor in at least 5% of work-related fatalities (Breugem *et al*., 2006). According to Cesarini *et al*. (2013), construction works involve complex tools and machinery, with some works carried out at significant heights above ground level and as such, companies need to actively war against the abuse of mind-altering substances, which remains a widespread problem in the construction industry. Construction companies should focus on preventing impaired workers from gaining entry or even handling job functions in and within site.

Health Issues

Consuming excessive amounts of alcohol puts employees at risk of developing an array of costly physical health problems such as liver diseases, heart disease, cancer, pancreatitis, and foetal alcohol syndrome in children. Long-term use of alcohol may also lead to hypertension, high cholesterol, and increased levels of triglycerides (NBGH, 2009). Approximately 15% of heavy users of alcohol battle with liver cirrhosis and pancreatitis. Individuals that inject opioids are at risk for hepatitis, HIV, and tuberculosis; cocaine users may have sinusitis, malnutrition, or myocardial infarction, among other lists of related health difficulties (NBGH, 2009). Alberta Health Services (2010) further revealed that cancer of the oral cavity and the pharynx resulted in an increased risk of disability for construction workers when compared to the general workforce. This finding may reflect the high rates of smoking and heavy drinking among construction workers. It was also stated that the risk of disability greatly increased in direct proportion to individual ages of the users.

Mental Health Disorders

The excessive use of alcohol and other drugs can also be linked to untreated depression and other mental illnesses. As such, high expenditures for physical healthcare often accompany the regular use and abuse of drugs. 52% of privately insured persons being treated for drug abuse had also been

diagnosed with at least one psychiatric condition. The most frequent conditions were depression (35%), adjustment disorder (11%), bipolar disorder (8%), anxiety disorder (6%), and personality disorder (5%). Often, the co-occurring psychiatric disorder is related to drug use, and it may disappear as a result of a reduction in the illicit consumption of those drugs (NBGH, 2009). It is recommended that this observation should take place over a 3-4 week drug-free period where possible. Substance abusers should also be monitored for tendencies to commit suicide as they are observed to have higher rates of suicide at a rate of between 3-4 times higher than the general population (NBGH, 2009). According to Alberta Health Services (2010), a survey by Statistics Canada found that 33% of trades helpers and labourers reported poor mental health; it is plausible that some employees have turned to substance use and abuse to cope with stress.

RESEARCH METHODOLOGY

This study was carried out through a survey of selected literature together with an empirical study that was conducted using a quantitative approach. A well-structured questionnaire that reflects the peculiarity construction work, distributed to all respondent forming part of the sample population, formed the quantitative research.

This study draws its population from two (2) major stakeholders in the construction industry within the study area, which are; site managers and consultants respectively. It was initially intended that this population would be drawn from on-going registered construction projects within Minna-as directed by the development control agency of the state. But on questioning the agency, it was discovered that there were no on-going registered construction projects within the area of study and that this was due to the current corruption chase going on around the country, forcing clients to avoid pushing out too much cash for construction works. So major construction works were either halted or permanently stopped. Due to this challenging twist, the study was forced to draw its sample population from a survey conducted by V-connect (2014), an online job-hunt site, which gathered that there were 50 registered construction firms in Minna, Niger state Hence, the sample frame is estimated at 300.

The sample size of this research was determined using Berlett, Kotrlik and Higgins (2001) table for determining sample size for a given population. Hence, the sampling size chosen for a population of 300 is 65. Out of the 65 distributed questionnaires, 60 were completed and returned within the required time frame. Hence the questionnaire response rate is estimated at approximately 92.3%. The various opinions of respondents were gotten and ranked from the positive rating to the negative rating using a Likert scale of 1-5. Where 1 = Very Low and 5 = Very High. In using the ranking method, the mean ranks were obtained.

Descriptive statistics were used to analyse the quantitative data; this was employed primarily to reveal the difference in the demographic attributes of respondents. This involved the use of frequencies, percentage analysis, and mean score ranking. Data presentation was done in the form of tables, pie and bar charts and these analyses were carried out using SPSS version 20.0 and Microsoft Excel (spreadsheet) respectively.

ANALYSIS AND DISCUSSION

This section presents the research findings, analyses and provides discussions based on such respective findings.

Table 4.1: ***The grouping of mean scores (MS) for five-point 'Likert' scales***

> 1.00 ≤ 1.80	- Not important to less than important - Minor to near minor extent - Very poor to poor - Very rarely to rarely
> 1.80 to ≤ 2.60	- Not important to less than important (less than important) - Minor to near minor extent (near minor extent) - Poor to slightly poor (slightly poor) - Rarely to more than rarely (rarely)
> 2.60 to ≤ 3.40	- Less than important to important (important) - Near minor extent to some extent (some extent) - Slightly poor to almost good (average) - More than rarely to almost frequently (almost frequently)
> 3.40 to ≤ 4.20	- Important to more than important (more than important) - Some extend to near major extent (near major extent) - Averagely good to good (good) - Almost frequently to frequently (frequently)

Source: William, 2014

> 4.20 to ≤ 5.00	- More than important to very important (very important) - Near major extent to major extent (major extent) - Good to very good (very good) - Frequently to very frequently (very frequently)

Importance of Certain Project parameters to Productivity

Table 4.2 below, displays how important certain project parameters are to the overall productivity of the construction site according to the surveyed respondents. The responses are tabulated regarding percentages at a range of 1 (not) to 5 (very), and a Mean Scale with a minimum value of 1.00 and a maximum value of 5.00. Mean Scales > 3.00 indicates that respondents deem that the parameters are important as opposed to unimportant, as in the case of Mean Scales ≤ 3.00. It is notable that all the Mean Scales calculated are above 3.40 (i.e., Important to more than important).

Cost is ranked highest on a Mean scale of 4.84 (Which signifies it is a Very important parameter to overall productivity). In other words, this indicates that –according to the respondents- cost is the most important project parameter above all the other listed.

Table 4.2: Importance of certain project parameters to productivity

PARAMETER	RESPONSE IN PERCENTAGE						MEAN SCALE	RANK
	UNSURE	NOT----------				----------VERY		
		1	2	3	4	5		
Cost	5.00	0.00	0.00	5.00	5.00	85.00	**4.84**	**1**
Environment	0.00	0.00	5.00	40.00	45.00	10.00	**3.60**	**6**
Health and Safety	0.00	0.00	5.00	10.00	35.00	50.00	**4.30**	**4**
Quality	0.00	0.00	0.00	20.00	25.00	55.00	**4.35**	**3**
Schedule (time)	0.00	0.00	5.00	15.00	15.00	65.00	**4.40**	**2**
Labour	0.00	0.00	0.00	15.00	45.00	40.00	**4.25**	**5**

Source: Authors' Fieldwork, 2016

Effects of Drug Abuse on Productivity in Construction Sites

From Table 4.3 below it is seen that workers' ability to follow instructions with a mean scale of 3.84 is ranked first among the listed aspects of construction which are negatively affected by drug abuse. Following closely at second place is carelessness with a mean scale of 3.80. At third place, we have Violence on site which is ranked on a mean scale of 3.55. Occupying the fourth position is Friction among workers with a mean scale of 3.53. Mistakes and Theft on site are ranked jointly at the fifth positions with mean scales of 3.50 respectively. According to the respondents, all of the above-mentioned aspects are negatively affected by workers' drug abuse in a near major extent (that is > 3.40 to ≤ 4.20), and these aspects represent (60%) of the total listed aspects. These, in turn, affect the Cost, Schedule and Job Quality as ranked in Table 4.2. Workplace injuries, trustworthiness, and performance (speed) are ranked least among the negatively affected aspects of construction with mean scales of 3.35, 3.17, and 2.60 respectively indicating that they are affected negatively at a near minor to some extent. It is also worthy to note that none of the aspects fell in the bottom two Mean scale ranges of > 0.00 to ≤ 0.83 or > 0.83 to ≤ 1.67.

Table 4.3: ***Effects of drug abuse on happenings in the construction site***

ASPECTS	RESPONSE IN PERCENTAGE							MEAN SCALE	RANK
	UNSURE	DOES NOT	MINOR----------				----------MAJOR		
			1	2	3	4	5		
Ability to follow Instructions	5.0	0.0	0.0	15.0	15.0	35.0	30.0	**3.84**	**1**
Carelessness	0.0	0.0	0.0	15.0	20.0	35.0	30.0	**3.80**	**2**
Mistakes	0.0	0.0	0.0	10.0	35.0	50.0	5.0	**3.50**	**5**
Performance and Speed	0.0	0.0	40.0	15.0	10.0	15.0	20.0	**2.60**	**9**
Workplace Injuries	0.0	0.0	5.0	10.0	45.0	25.0	15.0	**3.35**	**7**
Absence from Site	5.0	0.0	25.0	40.0	15.0	5.0	10.0	**2.31**	**10**
Violence on Site	0.0	0.0	0.0	15.0	40.0	20.0	25.0	**3.55**	**3**
Friction among workers	5.0	0.0	0.0	5.0	45.0	35.0	10.0	**3.53**	**4**
Crime and theft on Site	10.0	0.0	5.0	20.0	5.0	45.0	15.0	**3.50**	**5**
Trustworthiness	10.0	0.0	0.0	30.0	25.0	25.0	10.0	**3.17**	**8**

Source: Author's fieldwork, 2016

Extent of Difficulties Experienced on Construction Sites Due to Drug Abuse on Sites

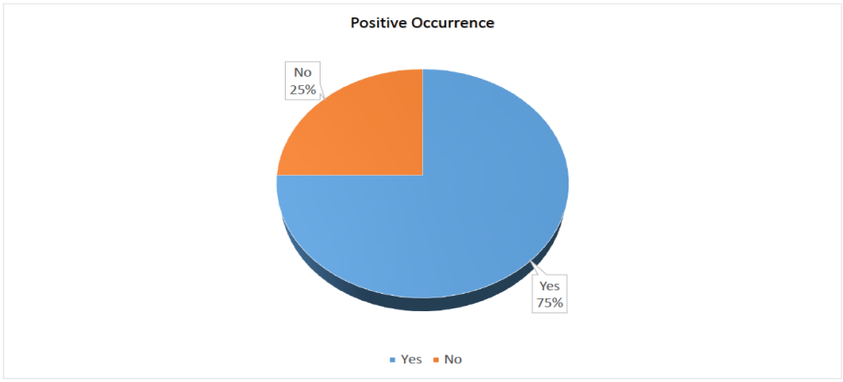
Table 4.4 below ranks the respondent's opinion on the occasions when worker drug abuse normally occurs. The various opinions are tabulated regarding percentages at a range of 1 (rarely) to 5 (frequently), and a Mean Scale with a minimum value of 1.00 and a maximum value of 5.00. Mean Scales > 3.00 indicates that respondents judge the occasions frequent as opposed to rare, as in the case of Mean Scales ≤ 3.00

From Table 4.4 below, according to the respondents, worker drug abuse frequently occurs during break time. This was chosen at first place with a mean scale of 4.05. Following closely at second place is a mean scale of 3.75, which showed that workers also frequently abused drugs before work periods. Furthermore, the table shows that drug is abused by workers frequently at the above mentioned periods as opposed to after work and during work hours with mean scales of 3.10 and 3.00 respectively (signifying that they occur only almost frequently). It should also be noted that the table illustrates that drug abuse can occur by workers at any time ranging from before to after work since none of the mean scales is within the 0.00 ≤ 0.83 range.

Table 4.4: ***Instances when Worker drug abuse mostly occurs.***

OCCASION	RESPONSE IN PERCENTAGE						MEAN SCALE	RANK
	UNSURE	RARELY----------FREQUENTLY						
		1	2	3	4	5		
Before work	0.00	20.00	10.00	0.00	15.00	55.00	**3.75**	**2**
During work	0.00	5.00	20.00	55.00	10.00	10.00	**3.00**	**4**
Break time	0.00	0.00	5.00	10.00	60.00	25.00	**4.05**	**1**
After work	0.00	15.00	30.00	10.00	20.00	25.00	**3.10**	**3**

Source: Author's fieldwork, 2016



Figures 4.1: Positive events which occurred in on the construction site as a result of drug abuse.
Source: Author's fieldwork, 2016

From figure 4.1 above, 75% (majority) of the respondents have witnessed positive occurrences as a result of drug abuse in the construction site. These positive events were noted to be from areas on performance/speed (which was ranked as least to be negatively affected by drug abuse from table 4.1). The other 25% (minority) were of the opinion that they hadn't witnessed any positive occurrences owing to drug abuse in the construction site.

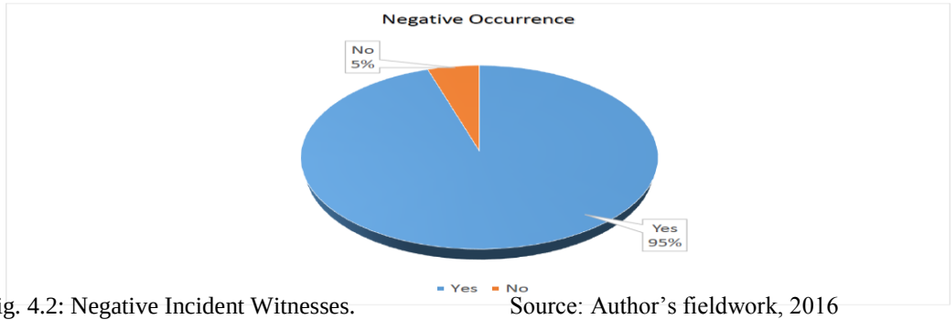


Fig. 4.2: Negative Incident Witnesses. Source: Author's fieldwork, 2016

From figure 4.2 above it can be seen that 95% (majority) of the respondents have witnessed negative occurrences owing to drug abuse. These occurrences arise from areas such as Inability to follow instructions, Carelessness, Violence on site, etc. (as ranked respectively in table 4.1.) The other 5% (minority) are of the opinion that they have not witnessed any negative occurrences in any construction site as a result of worker drug abuse. However, it should be worthy of note that a higher percentage of the respondents (precisely 95%) have witnessed negative occurrences owing to worker drug abuse in construction sites, as compared to about 75% who have witnessed positive occurrences.

Respondents' Opinion on Reasons behind Drug Abuse by Workers

This section analysed the possible reasons behind the abuse of drugs by construction site workers. A ranking of the respondent's opinion on the reasons behind worker drug abuse is given in table 4.5 below.

Table. 4.5 ***Reasons behind drug abuse by construction site workers.***

REASONS	RESPONSE IN PERCENTAGE UNSURE	MINOR----------MAJOR 1	2	3	4	5	MEAN SCALE	RANK
Experimental curiosity	10.0	35.0	15.0	30.0	5.0	5.0	**2.22**	**6**
Lack of Supervision	0.0	15.0	35.0	20.0	20.0	10.0	**2.75**	**5**
Pressure from other workers	0.0	15.0	25.0	30.0	20.0	10.0	**2.85**	**4**
Availability of drugs	0.0	5.0	30.0	15.0	45.0	5.0	**3.15**	**3**
Personal Problems	0.0	0.0	10.0	15.0	45.0	30.0	**3.95**	**2**
Need to work for long Hours	0.0	0.0	0.0	5.0	25.0	70.0	**4.65**	**1**

Source: Author's fieldwork, 2016

The various reasons are tabulated in terms of percentages at a range of 1 (minor) to 5 (major), and a Mean Scale with a minimum value of 1.00 and a maximum value of 5.00. Mean Scale's > 3.00 indicates that respondents deem the reason as a major one as opposed to a minor one, as in the case of Mean Scales ≤ 3.00. It can be observed from the table that –according to the surveyed respondents- the need to work for long hours (ranking 1st with a Mean scale of 4.65) and personal problems (ranking 2nd with a Mean scale of 3.95) are major reasons why drugs are abused by construction site workers. It can also be observed that drug availability, pressure from other workers, and lack of proper supervision, ranking 3rd, 4th, and 5th respectively (with Mean scales of 3.15, 2.85, and 2.75) are to some extent, reasons behind workers drug abuse. The table also shows that Experimental curiosity is least among the listed reasons behind worker drug abuse, due to a calculated mean scale of 2.22 (which signifies only a near minor extent).

Measures Put In Place to Eliminate Drug Abuse on Sites

Table 4.6 below ranks a list of measures usually employed to tackle the usage and abuse of drugs by construction site workers. The ranking is calculated based on the respondent's judgement on the implementation of the listed measures in the construction industry within the study area. The respective judgements of the 60 surveyed respondents are tabulated in terms of percentages at a range of 1 (very poor) to 5 (very good), and a Mean Scale with a minimum value of 1.00 and a maximum value of 5.00. Mean Scale's > 3.00 indicates that the respondents deem the implementation of a measure very good as opposed to poor implementation, as in the case of Mean Scales ≤ 3.00.

Table. 4.6: ***Table showing a ranking of measures put in place to eliminate worker drug abuse***

MEASURE	RESPONSE IN PERCENTAGE UNSURE	VERY POOR-----VERY GOOD 1	2	3	4	5	MEAN SCALE	RANK
Testing employees before allowing them on site.	0.0	65.0	15.0	10.0	5.0	5.0	**1.70**	**4**
Setting up laws against drug use on site	0.0	25.0	30.0	25.0	10.0	10.0	**2.50**	**2**
Employee assistant programmes.	0.0	40.0	35.0	15.0	10.0	0.0	**1.95**	**3**
Awareness programmes	5.0	15.0	35.0	25.0	5.0	15.0	**2.55**	**1**

Source: Author's fieldwork, 2016

It is evident from the respondents' judgement that not even one of the mean scale measure is equal or greater than 2.60 (almost/averagely good). This signifies that the implementation of the listed measures ranges only from a very poor to a slightly poor level. However, leading the group is the implementation of Awareness programmes which is ranked at first position with a mean scale of 2.55 (signifying just a slightly poor implementation rate). Setting up Laws and Employee assistant programs ranked at second and third positions are also judged by respondents as a slightly poor implementation rate as shown by the calculated mean scales of 2.50 and 1.95 respectively. Occupying the very last position is the measure which involves testing employees before allowing them on site. This measure is ranked fourth with a calculated mean scale of 1.70 signifying a very poor level of its implementation within the construction industry in the study area.

Summary of Findings

The summary of findings relative to the objectives of the study is as follows;

I. Drug and alcohol abuse negatively affects the workers' ability to follow instructions at a near major to major rate. It is also a major reason behind carelessness, violence on site, friction among workers, mistakes, and theft.
II. Trustworthiness and worker speed (performance) are not -necessarily- negatively affected by drug abuse. But on the contrary, worker speed (performance) boosted -to some extent- with the consumption of drugs.
III. The major reason behind drug abuse by workers is the need to work long hours and also due to workers' personal problems.
IV. Adequate measures are not put in place by the construction industry to tackle drug abuse by workers.

CONCLUSION

Construction sites work is challenging, and hazardous. To meet up with task challenges, many construction workers resorted to taking illicit drugs as a stimulant to aid their productivity. Although this stimulates them to carry out their work to some extent, the negative impact it has on them regarding paying attention to instruction, their health, absenteeism, friction on sites that play negatively on their productivity cannot be overemphasised. Drug abuse by workers in the construction industry is prevalently higher than the abuse as witnessed in many other industries worldwide. Hence this research has been able to show that drug abuse is a problem to the productivity within the construction environment. Furthermore, it is saddening to know that adequate measures are not put in place to curb this menace. This study, therefore, called for the construction industry to design, and adequately implement a policy that would eliminate the use of illicit drugs on sites by workers.

Recommendations

Based on the findings of this research, the following recommendations are proffered;

A major awareness campaign should be kick-started to feed members of the construction industry with the knowledge required to eliminate drug abuse out of the industry. A drug abuse policy must be implemented together with employee assistant counselling programs to help workers combat the desires and pressures to engage in drug misuse. This research has focused on the effect of worker drug abuse on labour productivity alone. Hence, further research can be done to determine the long-term effects of drug abuse by examining the average life expectancies of both construction workers who used and didn't use a drug to stimulate self for work. Also, further research could be done on the availability and implementation of health and safety policies against drug abuse by construction site workers. This would aid in knowing how far the industry has gone in trying to reduce drug usage by her workers.

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URBAN ECOLOGY MANAGEMENT

ASSESSMENT OF RECREATIONAL SPACES IN PUBLIC SECONDARY SCHOOLS, MINNA, NIGER STATE

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A school is an institution where learning takes place. However for learning to be effective, other supporting facilities that enable the students to learn need to be available. Participating in recreation activity is a part of student's everyday life. They have positive effects on student's lives by improving behaviour, school performance, school completion, positive aspects to make successful adults, and social aspects. The aim of this study is to assess the different types of recreational spaces provided in public secondary schools in Minna, Niger state, with the purpose of providing information on how these recreational spaces can improve the social aspect of students. Data was obtained from the field using observation schedule. For the purpose of this study, different public secondary schools were selected using simple random sampling. The results revealed that most of the schools have football fields provided which serves as an active recreational space while well-defined passive recreation spaces were not provided. Students sat under tree shades on the ground to form social gatherings in the school environment. Therefore, it was recommended that the government should look into providing recreational spaces in secondary schools as it allows students broaden their regular curriculum and participate in different activities that will create a positive atmosphere in schools.

Keywords: facilities, learning, recreational space, secondary school, social aspect

INTRODUCTION

A school is an institution where learning takes place. They are established for the purpose of teaching and learning. It is also more important that the teachers and learners are properly accommodated to facilitate the teaching and learning that goes on there. This is the essence of the school plant and facilities (Alimi, 2004). People have a natural tendency to believe that the connection between better school buildings and student learning is clear but proving this in a scientific experiment is difficult (Woolner et al., 2007). Therefore school facilities are the space interpretation and physical expression of the school curriculum. In Nigeria at large, secondary schools, irrespective of ownership are expected to function in compliance with the achievement of the country national education goals.

Schools are also conceived as places of social levelling, but this tends to emphasise the lowest common denominator rather than to raise expectations, opportunities and potentialities. Theoretically, government schools are intended to be places of equality of opportunity both educationally and in the provision of facilities. In practice, this tends not to happen. To achieve equality with the provision of facilities, governments tend to produce standard space schedules based on enrolment numbers. Although not impossible to overcome, this requirement creates a tension with architectural innovation (Andrew, 2004).Recreation has been defined as the act of refreshing the mind and body after work by means of various activities. It involves refreshing the health and spirit by relaxation and enjoyment. The need to engage in an activity for recreation is an essential element of human biology and psychology (Daniel, 1995).

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Meanwhile Butler (1960), defined recreation as any valuable, useful and communally accepted leisure experience that enhances individual performance physically and mentally. Therefore, recreation is an activity engaged by an individual during leisure time to take their mind off the day's rigour and norms of academic environment to refresh the body and get refocused for the daily activity.

Akinola (1985) affirms that recreation is an experience or an activity engaged in within ones leisure time, voluntarily chosen which provides pleasure or a sense of wellbeing to the people participating in it. Recreational spaces can either be active or passive; active recreational space is also referred to as core activities and generally any recreational activity that requires significant infrastructure for the purposes of active sports. Meanwhile passive recreation is regarded as non –core activities. According to Gilges, (1998), he described passive recreation as unstructured recreation, giving people whether as individuals or groups, the freedom and ability to create their own recreational activities. They include open space which is landscaped as parks, gardens, sitting-out areas, waterfront promenades, paved areas for informal games, children's playgrounds, jogging and fitness circuits etc., where people can enjoy the surroundings in a leisurely manner

In a school setting or environment where learning takes place, other social and sporting activities are also part of the learning process which is also as important as the learning process which is organised in the classroom. Therefore a school recreational activity and facilities is an important factor in school settings as it creates an avenue for students to come together irrespective of culture or religion to participate in the various recreational activities present in the school. Government and different private school owners need to pay closer attention to providing a comfortable learning environment suitable for both the staff and students as recreational spaces also make up this learning environment. This paper is therefore aimed at assessing the different types of recreational spaces provided in public secondary schools in Minna, Niger state, with the purpose of providing information on how these recreational spaces can improve the social aspect of students.

Recreation as an Extracurricular Activity in School

A research carried out at 5 Zone in district Lucknow of Uttar Pradesh on two Government and two private schools of the urban area revealed that extracurricular activity is a part of student's everyday life. They play important roles in student's lives. They have positive effects on student's lives by improving behaviour, school performance, school completion, positive aspects to make successful adults, and social aspects **(**Singh & Mishra, 2015). Stoltzfus (2007), showed in his study that extracurricular activities are offered at most schools in the United States and can consist of a wide range of activities that do not form a part of the regular school curriculum. Most schools allow a free choice for student involvement in these activities, but many private schools make involvement in one or more extracurricular activities a mandatory requirement for their students believing that such a mandate helps to create a more "well-rounded" student. While Emmer (2010), said that the terms extracurricular activities and non-classroom activities have all been used interchangeably to mean experiences and activities such as debate, athletics, music, drama, school publications, student council, school clubs, contests, and various social events.

Health Benefits of Recreation to Students

Ellen, (2017) stated that Secondary schools enhance the health and productivity of students, teachers, and staff. This can be achieved by Schools providing platform spaces for gathering, sitting, presenting and alcoves for reading and studying. According to Frumkin et al (2007), he explained that one of the most pressing concerns today regarding the health of children is the ever increasing rate of obesity, which many tie to the decrease in children's physical activity in recent decades. Baker & Bernstein (2012), concludes that a lot is known about how important physical activity is for children's health, but less is known about how to ensure high levels of physical activity through the design of schools. Research is still needed to test theories about how these designs should be executed and how to improve them.

The Study Area

The study area, Minna is known to be the state capital of Niger state. Its geographical coordinate ranges from latitude 9º36", longitude 6º33" to latitude 9º39", longitude 6º30", at an average elevation of 299m above sea level in west Central Nigeria. Minna is estimated to have a population of about 304,113 and it consists of two major ethnic groups: the Nupes and the Gbagyis.

RESEARCH METHOD

The research method employed for this study was the descriptive research method. This method employed includes the process of self-observation and studying of a sample population as a means of data collection. Data from self-observation and direct site seeing was recorded in an observation schedule which was structured inform of a checklist. The assessment was conducted in Minna, Niger state, Nigeria. The two local government which lies within Minna includes Bosso and Chanchaga Local governments. This two local government are further divided into 14 district areas. Ten public secondary schools were selected using simple random sampling from ten district areas within Minna. The data derived from the observation schedule were analysed using descriptive statistics (frequencies and percentages), pie charts and bar charts. Pictures were also taken and all used in computing the results. The ten public secondary schools selected from the two local governments are tabulated below:

Table 1: List of Schools Selected In Minna

S/N	NAME OF SCHOOLS
1	Ahmadu Bahago Secondary School Bosso Road
2	Zarumai Model School Musa Zago Road
3	Bosso Secondary School
4	Government Day Secondary School, F layout, Bosso Road
5	Sir Ahmadu Bello Memorial Academy, David Mark Road
6	Day Secondary School, Tunga
7	Day Secondary School, Gbada,Gidan Mongoro
8	Junior Secondary School, Barikin Sale
9	Day Secondary School, Chanchaga
10	Governemt Day Secondary School, Maitumbi

Source: authors field work (2017)

RESULT FINDINGS AND DISCUSSIONS

The results obtained through the observation schedule are analysed as follows.

The chart in figure 1 above reveals the percentage of the different type of sport areas provided in public secondary schools, Minna. 65% of the secondary schools have football field provided, 14% of the schools have outdoor badminton and basketball areas while 7% have volleyball areas provided in the secondary schools as sport areas. Results from this section shows that majority of the secondary school assessed have football field as sport area provision.

Table 2: Type of Outdoor Sport Area Provided

	NAME OF SCHOOL	Type of outdoor sport area provided			
		Football	Volleyball	Badminton	Basketball
1	Ahmadu Bahago Secondary School, Bosso Road	●		●	●
2	Zarumai Model School	●			
3	Bosso Secondary School	●			
4	Government Day Secondary School, F layout, Bosso Road				
5	Sir Ahmadu Bello Memorial Academy David Mark Road	●			
6	Day Secondary School, Tunga	●			●
7	Day Secondary School, Gbada,Gidan Mongoro	●			
8	Junior Secondary School, Barikin Sale	●			
9	Day Secondary School, Chanchaga	●	●	●	
10	Governemt Day Secondary School, Maitumbi	●			
	TOTAL	9	1	2	2

Source: authors field work (2017)

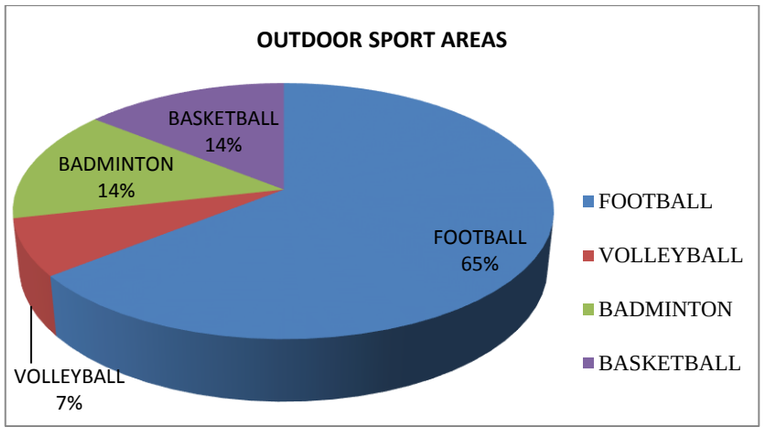

Figure 1: Type of Outdoor Sport Area Provided Source: authors field work (2017)

PLATE I: showing a school with basketball court
Source: authors field work (2017)

PLATE II: showing a school with football field
Source: authors field work (2017)

Table 3: Type of Space Provided for Social Gathering

S/N	Name of School	Type of space for social gathering			
		Tree shaded space	Indoor lounge	Open courtyard	Landscaped garden
1	Ahmadu Bahago Secondary School Bosso Road	●			●
2	Zarumai Model School	●			
3	Bosso Secondary School	●		●	
4	Government Day Secondary School F layout, Bosso Road	●			
5	Sir Ahmadu Bello Memorial Acedemy David Mark Road	●		●	
6	Day Secondary School, Tunga	●			
7	Day Secondary Schoo, Gbada,Gidan Mongoro	●			
8	Junior Secondary School, Barikin Sale	●			
9	Day Secondary School, Chanchaga	●			
10	Governemt Day Secondary School, Maitumbi			●	
	TOTAL	9	0	3	1

Source: authors field work (2017)

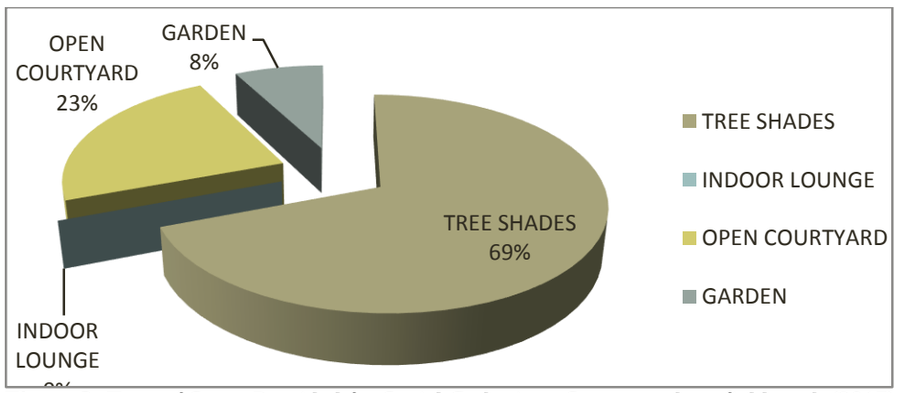

Figure 2: Type of Space Provided for Social Gathering Source: authors field work (2017)

The chart in figure 2 above reveals the percentage of the different type of space provided for social gathering in public secondary schools, Minna. Social gathering is known to be a component of passive recreation. 69% of the schools assessed have tree shades provided for relaxation, 23% had courtyards and 8% had gardens. None of the schools assessed has indoor lounges for relaxation. Results from this section shows that majority of the secondary school assessed are using tree shade areas for social gathering.

Plate III: showing a school with tree shaded area
Source: authors field work (2017)

Plate IV: showing a school with open courtyard
Source: authors field work (2017)

Table 4: Type of Objects at Outdoor Relaxation Areas

S/N	NAME OF SCHOOLS	Type of object for sight seeing			
		Landscape	Sculpture	Fountain	none
1	Ahmadu Bahago Secondary School Bosso Road	●		●	
2	Zarumai Model School				●
3	Bosso Secondary School	●		●	
4	Government Day Secondary School F layout, Bosso Road	●			
5	Sir Ahmadu Bello Memorial Acedemy David Mark Road	●		●	
6	Day Secondary School, Tunga	●			
7	Day Secondary Schoo, Gbada,Gidan Mongoro	●			
8	Junior Secondary School, Barikin Sale				●
9	Day Secondary School, Chanchaga				●
10	Governemt Day Secondary School, Maitumbi				●
	TOTAL	6	0	3	4

Source: authors field work (2017)

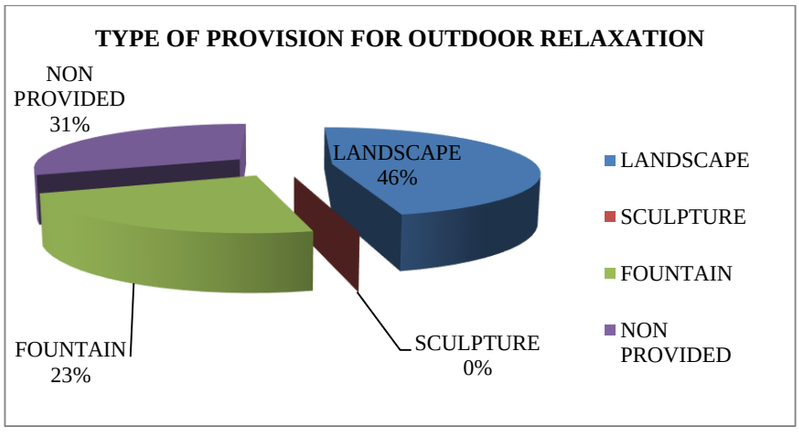

FIGURE 3: Type of Objects at Outdoor Relaxation Areas
Source: authors field work (2017)

The chart in figure 3 above reveals the percentage of the different type of objects provided around outdoor relaxation areas in public secondary schools, Minna. Outdoor relaxation is a component of passive recreation. This helps in meditating and calming of the mind. 46% of the schools visited have soft landscape around the school area. 23% have fountains provided while the other 31% of the schools has no provisions. Results from this section shows that majority of the secondary school assessed have soft landscaped area provided for outdoor relaxation.

Plate V: showing a school with soft landscape area
Source: authors field work (2017)

Plate VI: showing a school with fountain area
Source: authors field work (2017)

CONCLUSION AND RECOMMENDATION

The study has revealed that recreational spaces have not been given considerable attention in public secondary schools, Minna. It was observed that although majority of the schools have football fields provided which serves as an active recreational space; these fields were not well designed to serve as a comfortable sport area to the students. Less consideration was observed in the provision of other active recreational areas for the students. Also, provisions such as outdoor seats, amphitheatre which encourages social gathering were not provided. Students sat under tree shades to form social gatherings in the school environment. These would limit or deprive the students certain developmental needs which these spaces would have offered if they were present. The paper in conclusion recommends that the government, stake holders, and professionals involved in development of secondary schools should pay adequate consideration to

- Provide more active recreational areas such as volleyball court, badminton and basketball courts to broaden their regular curriculum and create a positive atmosphere in schools and improve on the design of football fields provided.
- Provide well defined outdoor gathering areas such as amphitheatres, fountain areas and tree shaded areas well landscaped with chairs to encourage social gathering among students as this builds their self-confidence and encourages group discussions among students.
- Provide well landscaped areas with different elements such as fountains, soft and hard landscape, and sculpture around the school environment which gives the students an avenue to meditating while reading and remain relaxed.

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LIVELIHOOD OPPORTUNITIES IN SOLID WASTE RECYCLING IN KADUNA METROPOLIS, NIGERIA

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Recycling is a process of waste management which has been in existence in Nigeria for quite a while, but its general application has been low. This is as a result of the ignorance of the public to the environmental and economic benefits of recycling and reuse. This study analyzed the economic benefits in solid waste recycling and reuse in Kaduna metropolis, Kaduna state. Field survey and questionnaire administration was undertaken. This study measured volume of trade in terms of revenue and Kakuri market has the highest daily average volume of trade at ₦4,567,361 while Bakin Dogo has the least volume of trade at ₦4983. The condition of infrastructures and facilities using index in Ungwan Muazu, Old Panteka, New Panteka, Bakin Dogo and Kakuri market is bad (0.37), bad (0.37), fair (0.47), poor (0.40) and poor (0.43) respectively. The most prevalent challenge faced by local recyclers and waste dealers and brokers is the problem of inadequate infrastructures and facilities as indicated by 97% of respondents. The result of hypothesis testing showed that volume of trade of local recyclers and waste dealers and brokers, accounts for 18% of their wellbeing. Recommendation made was that a new collective recycling market, which would have all necessary and efficient infrastructures and facilities should be provided. This would make the recycling process easier and convenient.

Keywords: Livelihood, Recycling, Volume of trade, Infrastructures

INTRODUCTION

Solid waste can be seen as non-liquid and non-gaseous products of human activities considered as being useless and unwanted and could take the form of garbage and sludge (Ishoka, 2008). Nevertheless the word “unwanted” is subjective and what is termed waste for one could be valuable for another person in a different condition or context. This real value of waste in many low-and middle-income countries (developing countries) is confirmed by the huge informal sector that earn their livelihood on waste collection and recovery (Van de Klundert and Justine, 2001). One of the challenges of largely populated areas is the volume of waste generated, its disposal and management. Poor waste management is one of the effects of rapid urbanization and industrialization especially in developing nations. In Nigeria, records show that only 8% of Nigeria’s population lived in cities at 1921, the figure grew to 20% in 1970, 30% in 1993, and 40% in 1996. The urban population is growing at an alarming rate. While the Nigerian population is increasing by about 2.8% per annum, urban growth rate is as high as 5.5% per annum (UDBN, 1998). As at 2009, an estimated 25 million tons of municipal solid waste was generated annually. The generation rates varied from 0.66kg/cap/d in urban areas to 0.44 kg/cap/d in rural areas (Ogwueleka, 2009). The rate of municipal waste generation increases every year. Waste generated is directly proportional to population, socio-economic status and level of urbanization (Adeoye et al., 2011; Adewole, 2009; Olanrewaju and Ilemobade, 2009). Recycling is a technique of waste disposal and it can be defined as the practice of converting waste items into materials that are reusable and valuable. It is an alternative to "conventional" waste disposal that can save material and help lower greenhouse gas emissions. Recycling helps minimize the use of new natural resources and check the waste possibly valuable materials, thus decreasing: energy usage, air pollution (from incineration) and water pollution (from landfilling). (letsrecycle.com, 2006).

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Shaibu, et al., (2018). **LIVELIHOOD OPPORTUNITIES IN SOLID WASTE RECYCLING IN KADUNA METROPOLIS, NIGERIA.** Contemporary Issues and Sustainable Practices in the Built Environment. School of Environmental Technology Conference, SETIC, 2018

There has been some traditional methods of recycling and reuse. The concept of reuse and recycling is not novel in Nigeria, but the modern technologies applied in recent times are relatively new. There is massive insufficiency of waste facilities in developing countries, but even so, sizeable amounts of waste are recycled (Tajuddeen, 2003). Despite the numerous benefits related to reuse and recycling, only a limited number of countries apply them (Anthony, 2009). Nzeadibe (2006), indicates that in Nsukka, it is the informal sector that carries out recycling practices. This is because there are no constitutional measures put in place to encourage and necessitate recycling in Nigeria. Such that individuals and institutions are not duty-bound to exercise recycling and reuse strategies. Furthermore, since there is no official recovery programme existing, people do not see the importance or have the drive to recycle their waste. Therefore, informal waste recycling in Nigeria is faced with poor amenities and infrastructures available to the informal recycle network in the process of recycling and reusing waste; Unsanitary and unsafe working conditions of waste pickers and others involved in informal sector recycling which increases the morbidity of the informal sector waste recyclers (Njoroge *et al.*, 2013); negative attitude of the public towards informal waste workers as they see it as a dirty job (Medina, 2000); the informal sector recycling is ignored by the government, which causes a lot of institutional problems for them (Marello & Helwege, 2014). Past researches on solid waste recycling show that recycling has a lot of socioeconomic and environmental benefits as well as challenges but these has not been fully explored in Kaduna metropolis. The lack of such information is a research gap that should be bridged. The aim of this research is to analyze the economic benefits in solid waste recycling and reuse in Kaduna metropolis, Kaduna state.

The set objectives are to;

i. Examine characteristics of waste recycling and reuse trade in Kaduna metropolis;
ii. Determine the volume of trade in reuse and/or recycling industrial waste (aluminium, brass, iron and copper wire waste) and agricultural waste (sacks) in Ungwan Muazu, New and Old Panteka, Bakin Dogo and Kakuri markets;
iii. Assess the infrastructures available in the enumerated waste recycling and re-use market;
iv. Identify the challenges encountered by recyclers and re-users in their trade.

The research hypothesis is to establish the relationship between the volume of trade in solid waste recycling and reusing and the wellbeing of waste brokers and dealers.

H_0 There is no relationship between volume of trade and wellbeing of local recyclers and waste brokers and dealers.

This study proposes sustainable livelihood approach as a perspective in understanding the livelihoods of the urban poor in general and those involved in solid waste management in particular. Livelihood approach focuses on poverty eradication and encouragement of economic growth which benefits the poor and targets policies that create sustainable livelihoods for the poor by promoting human development and conserving the environment (Solesbury, 2003). Livelihood as dictated by chambers and Conway (1992), comprises the capabilities, assets (stores, resources, claims and access) and activities required for a means of living: a livelihood is sustainable which can cope with and recover from stress and shocks, maintain or enhance its capabilities and assets, and provide sustainable livelihood prospects for the subsequent generation; and which contributes net benefits to other livelihoods at the local and global levels and in the short and long term".

Chambers and Conway (1992) classified the sustainability of livelihoods into two as:

- Environmental Sustainability: This refers to the external impact of livelihoods on other livelihoods. Here, the question is whether livelihood activities maintain and enhance or deplete and degrade the natural resource base. On the negative side, livelihood activities may contribute to desertification, deforestation, soil erosion and the like. To this end, livelihood activities can be regarded as environmentally unsustainable if they have a net effect on the claims (demands and appeals which can be made for material, moral or other support) and access (opportunity in practice to use a resource, service or obtain information, material, technology, employment, food or income) needed by others (Mensah, 2014).

- Social Sustainability: This defines whether an individual or household cannot only gain but maintain an adequate and decent livelihood. Here, two dimensions can be identified based on the work of Chambers and Conway (1992). The negative dimension relates to

coping with stress (pressures which are typically continuous and cumulative, predictable and distressing such as seasonal shortages, rising populations leading to declining farm size or 10 declining resources, indebtedness and others) and shocks (impacts which are typically sudden, unpredictable and traumatic such as storms, floods, wars, droughts, human illness, epidemics of crop pests and so forth) while the positive dimension relates to enhancing and exercising capabilities in adapting to, exploiting and creating change, and in assuring continuity (Mensah, 2014).

Njoroge *et al.,* (2013) indicated the following five key elements for sustainable livelihood:

i. Shock context, which are the source of insecurity to which the poor and their assets are exposed.

ii. Livelihood assets, which comprises all assets that individual households and institutions, use to maintain their livelihoods.

iii. Assets to and use of the capitals is influenced by policies and structures that govern individual and institutions

iv. Livelihood strategies, which in solid waste management include, reuse, recycling, composting, scavenging, informal collection of waste and even incineration.

v. Sustainable livelihood outcomes like improved income, improved housing, and education for children and quality environment among many other positive outcomes

Sustainability of livelihood is a function of how men and women utilize assets portfolios on both short and long term basis to be able to cope with and recover from shocks and stresses through adaptive coping strategies. It should be economically sound, ensuring that livelihoods activities do not irreversibly degrade natural resources within a given ecosystem. Solid waste management and urban poverty can best be understood from the point of view of the Livelihoods Approaches. Due to urbanization and globalization the urban poor have lacked access to basic necessities of life. Solid waste management as a source of income has provided livelihoods for the urban poor. The Livelihoods Approaches are best suited as they stress on utilizing and building on the best existing tools for the circumstances at hand which may include recycling, composting, reuse and even incineration and also an analysis of how they will affect the environment by incorporating the sustainability context (Njoroge *et al.*, 2013).

For the purpose of this study, the unit of analysis was asset ownership as these are one of the building blocks of the sustainable livelihoods approaches. Rakodi (2002), said that the sustainable livelihood approach recognizes that the poor may not have cash or other savings, but they have other material or nonmaterial assets, such as their health, labour, their knowledge and skills, their kinship ties and friends, as well as the natural resources around them.

Study Area

This study was carried out in Kaduna metropolis. Kaduna metropolitan area comprises of two local government, they are Kaduna North local government area and Kaduna south local government area. Kaduna metropolis is located within Kaduna State. It is located within latitude 10.52^0N and longitude 7.44^0E. Kaduna metropolis is inhabited by 1,582,102 (world population review, 2016). The study area comprises of several markets within Kaduna metropolis, they include; Ungwan Muazu market, New Panteka market, Old Panteka market, Bakin Dogo market and Kakuri Market.

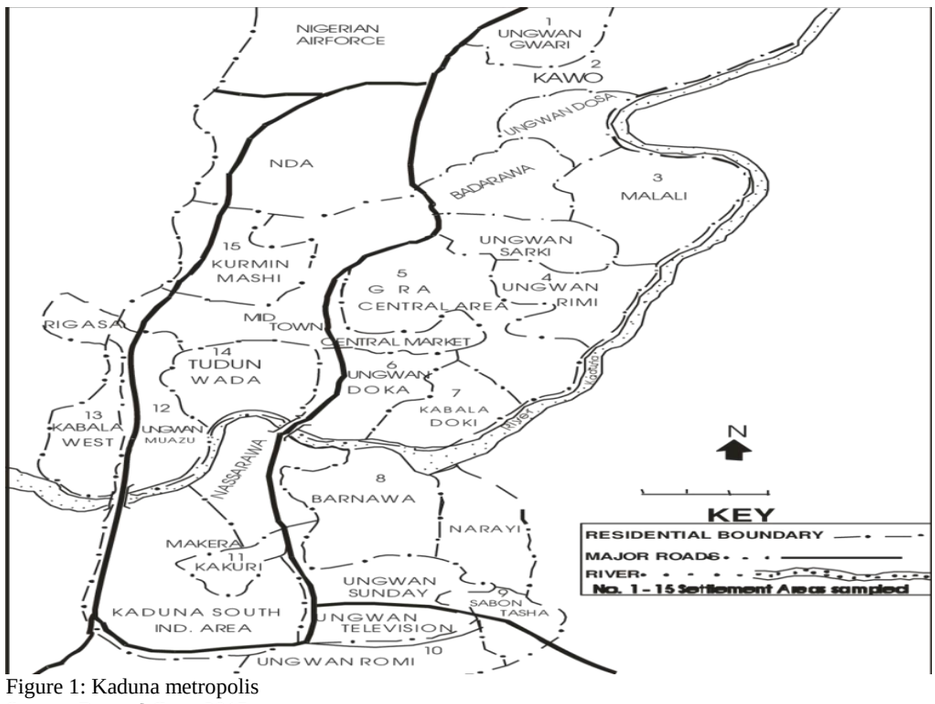


Figure 1: Kaduna metropolis
Source: ReseachGate, 2015

RESEARCH METHOD

The study used the case study research design which employed a purposive sampling technique. 119 questionnaires were administered to local recyclers, waste dealers and brokers in Kakuri, Bakin Dogo, new Panteka, old Panteka and Ungwan Muazu markets. The data was collected using both qualitative and quantitative techniques to obtain the primary data which was also supplemented by the secondary data. The Data collected was analyzed using both the descriptive and the inferential statistics. Linear regression analysis was applied in the study to examine the relationship between volume of trade and waste dealers and brokers as well as local recyclers. The Data was analyzed using Microsoft excel and JASP.

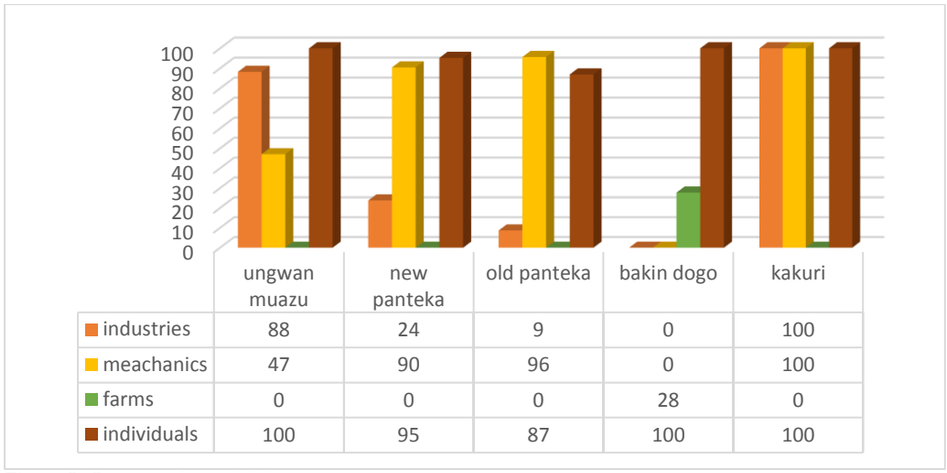
RESULTS AND DISCUSSION

Characteristics of Waste Recycling and Reuse Trade

Sources of Recyclable Waste

According to figure 3, waste dealers and brokers buy waste from farms, individuals, industries and mechanics. Sacks and chicken droppings are bought from farms, individuals provide all types of the enumerated waste. Iron, aluminum, brass and copper wire waste are bought from industries and mechanics. Kakuri market, New Panteka, Old Panteka, Ungwan Muazu market buy waste from individuals, mechanics and industries. The latter supplies most of the volume of waste they resell. The particular type of waste bought differs in the various locations. Bakin Dogo market buys their waste from farms and individuals.

Individuals include itinerant buyers, waste pickers and persons who own any kind of iron, aluminum, brass, copper wire, sack and chicken dropping waste. Figure 3 shows that individuals is the most common source of waste, followed by mechanics and then industries. Farms is the least common source where recyclable materials are bought from.

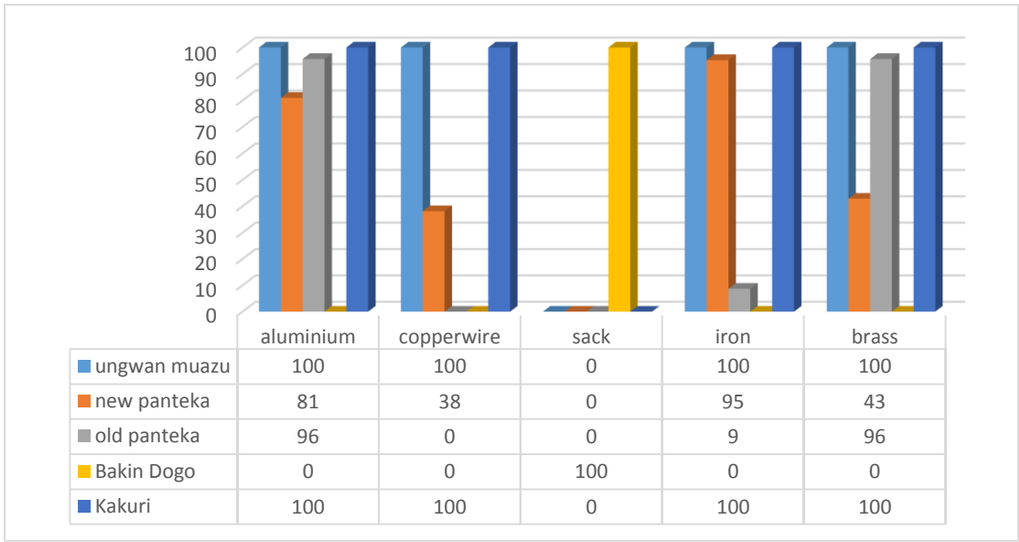


	ungwan muazu	new panteka	old panteka	bakin dogo	kakuri
industries	88	24	9	0	100
meachanics	47	90	96	0	100
farms	0	0	0	28	0
individuals	100	95	87	100	100

Figure 3: Sources of recyclable waste
Source: author's fieldwork, 2017.

Patronage in Waste Materials

Aluminum and brass waste are bought in that exact combination in Old Panteka market. In Kakuri market, Ungwan Muazu and New Panteka market, iron, aluminum, brass and copper wire waste is bought and sold in that particular combination. In Bakin Dogo market, the buying and selling sacks is carried out. Figure 4 gives a breakdown of the answers of respondents at different market. Each waste dealer has his own combination of waste materials he deals in. Note that these waste materials listed here are not the only type of waste material dealt in these markets but are the waste this research is concerned with.



	aluminium	copperwire	sack	iron	brass
ungwan muazu	100	100	0	100	100
new panteka	81	38	0	95	43
old panteka	96	0	0	9	96
Bakin Dogo	0	0	100	0	0
Kakuri	100	100	0	100	100

Figure 4: Waste materials traded in
Source: Author's fieldwork, 2017

Aluminum waste materials is bought by most respondents as shown in figure 4. This high rate means that it is the most recycled material in Kaduna. It is a recyclable material that is invested in by more than half of waste dealers and brokers in Kaduna. Brass is the second most patronized material. Brass along with aluminum is the materials usually locally recycled as well as sold off to foreign recycling plants which accounts for the high percentage of patronage in this two waste items.

Volume of Trade

The average daily volume of solid waste sold in the selected markets is presented in Table 1. The result of the analysis shows that Kakuri records the largest daily volume of solid waste trade (11153.5Kg), followed by Ungwan Muazu market with (4973.2Kg). The lowest volume of waste trade is recorded in old Panteka (335.2kg) and Bakin Dogo (7.6kg). The overall average volume of trade in solid waste trade from all the markets is 3741.6kg. The cells with no figures indicate that those materials are not sold in those markets.

Table 1: Average volume of waste sold daily

Market	Iron (kg)	Aluminium (kg)	Brass (kg)	Copper Wire (kg)	Sack (dozen)	Aggregate
Ungwan Muazu	3541.2	926.5	216.7	288.8	-	4973.2
New Panteka	1140.7	586.3	167.8	343.7	-	2238.5
Old Panteka	-	233.6	101.6	-	-	335.2
Bakin Dogo	-	-	-	-	7.6	7.6
Kakuri	5217.7	2821.3	1506.1	1608.4	-	11153.5

Source: Author's fieldwork, 2017

The pricing of each type of waste varies according to the value of the type of waste material. The pricing for each waste traded in is listed below in table 2. Copper wire waste is the most valuable waste material in terms of price, brass waste material is the second most valuable waste material.

Table 2: price of waste materials

Type Of Waste	Average Price (₦)	Minimum Price (₦)	Maximum Price (₦)	Standard Deviation
Iron	71.9	70.0	75.0	2.5
Aluminium	332.8	320.0	350.0	12.9
Brass	787.5	700.0	800.0	28.1
Copper Wire	1221.9	1200.0	1300.0	39.8

Source: Author's fieldwork, 2017.

The size of sacks is measured by the quantity of grain it will contain as seen in table 3.

Table 4.3: Prices of different sack types

Sack Type	Price (₦)
25kg with soft material	250
25kg with thick material	600
50kg	720
100kg	840

Source: Author's fieldwork, 2017

The unit of measurement for volume of trade is revenue and is indicated in table 4. Kakuri market produces the highest daily average revenue at ₦4,567,361. This shows that waste dealing and broking is a business with high economic activities that an individual could earn such an amount daily in revenue. This is not the actual income, but the amount made when waste is sold daily.

Table 4: Average daily revenue for the different markets

Market	Iron (₦)	Aluminium (₦)	Brass (₦)	Copper Wire (₦)	Sack (₦)	Aggregate (₦)
Ungwan Muazu	256,338	308,029	171,805	348,647	-	1,084,820
New Panteka	76,919	162,707	75,133	257,338	-	572,098
Old Panteka	-	233.6	101.6	-	-	
Bakin Dogo	-	-	-	-	4983	4983
Kakuri	381,451	962,780	1,204,903	2,018,225	-	4,567,361

Source: Author's fieldwork, 2017

Condition of Infrastructures in the Enumerated Recycling Markets

The provisions of facilities and services including; water supply, electricity supply, security, road, storage unit and toilet facilities in each of the markets were analyzed using condition index. The results are presented below.

Ungwan Muazu

The provision of infrastructures and services such as water and electricity supply, security of goods, toilet facilities, storage facilities for their goods as well as road for transporting of goods and movement of people is basic in Ungwan Muazu. There is no supply of water to the market, electricity supply is inconsistent, security of goods is moderate, storage facility is insufficient for goods and the road is in poor condition. Table 5 shows that the condition index for infrastructures and facilities in the market is 0.37 and this signifies that the provision as well as the condition of infrastructures and services is poor.

Table 5: Condition index of infrastructures and facilities in Ungwan Muazu recycling market

AMENITIES	Unavailable	Bad	Poor	Fair	Good	Very Good	Index
	0	1	2	3	4	5	
Water	O						0
Electricity				O			0.6
Security				O			0.6
Toilet		O					0.2
Storage			O				0.4
Road			O				0.4
Final index							0.37

Source: Author's fieldwork, 2017

New Panteka

There is no provision of water supply and electricity to New Panteka. This is because some parts of the market deal in the sale of old cars and car parts and hence are predisposed to fuel which is very flammable, hence the lack of provision of electricity is a safety measure. Just like Ungwan Muazu, New Panteka's index for the provision and condition of existing facilities and services is on average 0.37 as shown by table 6. This means that the situation of facilities and services is poor and requires rehabilitation of such services and facilities.

Table 6: Condition index of infrastructures and facilities in New Panteka recycling market

AMENITIES	Unavailable	Bad	Poor	Fair	Good	Very Good	Index
	0	1	2	3	4	5	
Water	O						0
Electricity	O						0
Security				O			0.6
Toilet				O			0.6
Storage				O			0.6
Road			O				0.4
Final index							0.37

Source: Author's fieldwork, 2017

Old Panteka

Water supply is poor, electricity supply is very bad in Old Panteka. The bad supply of electricity in this markets is a huge problem because local recycling is done in this market and the process requires power (electricity), and since the provision of electricity is poor, they resort to other means which are crude and expends a lot of human energy, this in turns adds to the cost of production as well as the duration of production. This reduces the productivity of recyclers in the market. Storage facilities i.e. their shops are not large enough to contain all their equipment, goods and resource materials. The storage space is too cramped and makes working inconvenient. Road is not conducive enough. Table 7 depicts the condition of facilities and services in the market as well as condition index of the market. The general index of the market's provision and existing situation of facilities and services is 0.47 which means that generally, the provision and condition of facilities is moderate or fair but it requires improving upon what is existing.

Table 7: Condition index of infrastructures and facilities in Old Panteka recycling market

AMENITIES	Unavailable	Bad	Poor	Fair	Good	Very Good	Index
	0	1	2	3	4	5	
Water			O				0.4
Electricity		O					0.2
Security					O		0.8
Toilet				O			0.6
Storage			O				0.4
Road			O				0.4
Final index							0.47

Source: Author's fieldwork, 2017

Bakin Dogo

Electricity and water supply in Bakin Dogo market is poor, security in the market is moderate, storage facility as well as conveniences is in poor condition. Road is in very bad condition in that vehicular access is limited. Vehicles cannot access the shops of individual

shops of sack dealers in the market. The overall index for Bakin Dogo market is 0.4 shown in table 8 indicates poor condition of all facilities in the market.

Table 8: Condition index of infrastructures and facilities in Bakin Dogo recycling market

AMENITIES	Unavailable	Bad	Poor	Fair	Good	Very Good	Index
	0	1	2	3	4	5	
Water			O				0.4
Electricity			O				0.4
Security				O			0.6
Toilet			O				0.4
Storage			O				0.4
Road		O					0.2
Final index							0.4

Source: Author's fieldwork, 2017

Kakuri

Water supply is poor in Kakuri Market, electricity supply is fair as well as the security of waste items. Storage units and road infrastructures are poor in that, storage units are not spacious enough to contain waste items, hence, waste is stored beside shops (storage units). The road is rough and has potholes which could damage vehicles. The index for the market's facilities and services is 0.43 as indicated in table 9. This index reveals that facilities and services are not that poor but could use upgrading.

Table 9: Condition index of infrastructures and facilities in Kakuri recycling market

AMENITIES	Unavailable	Bad	Poor	Fair	Good	Very Good	Index
	0	1	2	3	4	5	
Water			O				0.4
Electricity				O			0.6
Security				O			0.6
Toilet		O					0.2
Storage			O				0.4
Road			O				0.4
Final Index							0.43

Source: Author's fieldwork, 2017

Table 10 gives a summary of the condition of infrastructures and facilities in each of the five enumerated markets.

Table 10: Condition index of each market and their interpretation

Market	Market Index	Remark
Ungwan Muazu	0.37	Bad
New Panteka	0.37	Bad
Old Panteka	0.47	Fair
Bakin Dogo	0.40	Poor
Kakuri	0.43	Poor

Source: Author's fieldwork, 2017

Challenges Faced by Local Recyclers and Waste Dealers and Brokers

As expected with all endeavours, there are certain drawbacks to waste dealing and broking in terms of challenges or problems that plaque this profession. Figure 5 shows the challenges faced by waste dealers and brokers. It shows that insufficient space allocated to each business activity i.e. business premises and inadequate facilities and amenities such as water supply, electricity supply, conveniences, road and the likes are the most common challenges faced. Insufficient space is the second most prevalent problem faced by waste dealers and brokers Business premises in the different markets are not conducive enough in terms of spatial area.

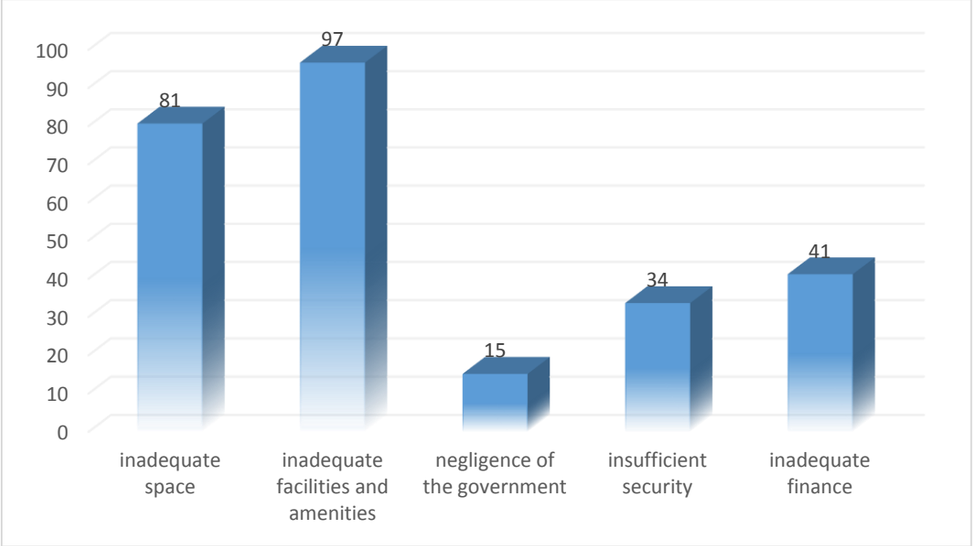


Figure 5: Challenges faced by waste brokers and dealers
Source: Author's fieldwork, 2017

Relationship between Volume of Trade and Wellbeing of Waste Dealers and Brokers

Asset ownership Among Local Recyclers and Waste Dealers and Brokers

The indicators of wellbeing for this study are asset ownership and capability to train children through formal education. The level of asset ownership of local recyclers and waste dealers and brokers is depicted in figure 6. Assets measured include television, electric fan, mobile phone, car/motorbike, living in own house, radio, air condition, refrigerator. All respondents owned mobile phones and radios, only 24% of respondents live in their own houses. On the average, the level of ownership of assets is more than fair seeing as the percentage of ownership of most asset is high.

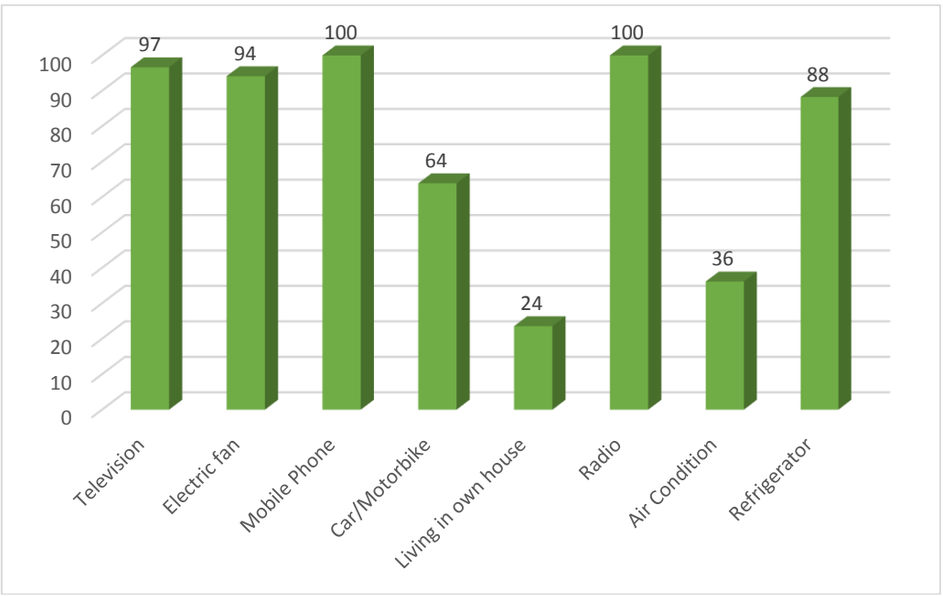


Figure 6: Asset ownership of local recyclers and waste brokers and dealers
Source: Author's fieldwork, 2017

Ability to Send Children to Formal School

More than half (54%) of respondents are able to send all their children to formal school while 46% of respondents have at least one child out of school as indicated in figure 7. This 46% include those that have no children and those that have some of their children in school.

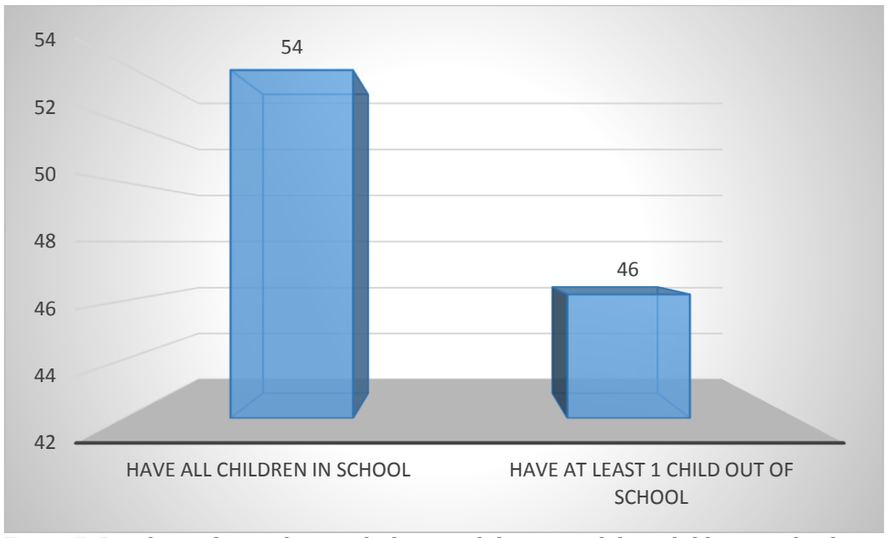


Figure 7: Local recyclers and waste dealers capability to send their children to school
Source: Author's fieldwork, 2017

Linear Regression Analysis of Volume of Trade and Wellbeing

Regression analysis was carried out to determine the relationship of volume of trade and wellbeing of respondents and the result of the regression analysis is revealed in table 4.22a-4.22c. It can be observed that there is a significant linear relationship between volume of trade and wellbeing hence the null hypothesis is rejected and alternative hypothesis H_1 is accepted. Table 4.22a indicates an R^2 value of 18.0% with F-statistics of 18.94 at (<.001) significance level. This means that the volume of trade of local recyclers and waste dealers and brokers accounts for 18% of their wellbeing. The remaining balance is accounted for by other factors or variables not considered by this study. Although this percentage is low, it is significant.

Table 4.22a: Model Summary

Model	R	R^2	Adjusted R^2	RMSE
1	0.425	0.180	0.171	0.288

a Predictors: (Constant), Volume of Trade

Table 4.22b: ANOVA[a]

Model		Sum of Squares	Df	Mean Square	F	p
1	Regression	1.571	1	1.571	18.94	< .001[b]
	Residual	7.135	86	0.083		
	Total	8.706	87			

a Dependent Variable: Wellbeing
b Predictors: (Constant), Volume of Trade

Table 4.22c: Coefficients[a]

Model		Unstandardized	Standard Error	Standardized	t	p
1	intercept	0.545	0.037		14.834	< .001
	volume of trade	0.000	0.000	0.425	4.352	< .001

Dependent Variable: Wellbeing
Source: Author's analysis, 2017

The model for the relationship is derived from the regression model coefficient (Table 4.22c). The model for the study is stated as follows:

$Y=\alpha + \beta_1 X_1$ ……..equation 1

Where Y= wellbeing α = intercept β = slope X = external factors

$Y= 0.545+0.000(x_1)$ ……..equation 2

CONCLUSION

Solid waste recycling and reuse in Kaduna is a gainful practice. It can be used as a waste management strategy to alleviate poverty especially among those who have little or no formal education. Recycling and reusing of solid waste has positive economic benefits

especially on the wellbeing of the members of the recycling network. Public enlightenment and awareness on the importance of waste recycling and reuse can enhance a better urban environment. It can also increase economic return on waste recycling and reuse which has a direct bearing on the livelihood of residents. It is therefore, concluded that if the Nigerian urban environment will achieve sustainability in waste management, the idea of waste recycling and reuse must be given an increased priority.

Recommendations

Based on the findings earlier discussed, it is the opinion of this study that a new collective recycling market should be constructed and developed. All recycling activities would be carried out there so that advantages of economy of scale could be enjoyed. A market that is planned and has all necessary infrastructures, facilities and services. These include; portable water supply, good electricity supply, adequate and efficient storage units and/or shops, adequate security within the market, roads that are in superb condition and can allow for the transportation of waste in and out of the market and toilet facilities that are convenient and sufficient. This should be done to improve the condition of recycling and reusing waste in Kaduna. The location of the new market should correspond with the intended user's opinion. It should be easily accessible to the public.

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EXPLORING THE TOURISM POTENTIALS OF CULTURAL LANDSCAPE OF NUPE COMMUNITIES IN CENTRAL NIGERIA

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Tourism has been identified as one of the major socio-economic activity in the world. The importance of tourism has also seen it being promoted as a key driver for socio-economic progress of nations. Albeit cultural landscapes are uniquely constituted and thus they offer the premise for tourism attraction. The Nupe cultural landscape has been found to have rich cultural heritage, but with limited exposure to the global community the tourism potentials. More also is that tourism destinations are not limited to physical landscape but also includes the social transactions of the people who inhabit such environment. Markedly, the Nupe communities in central Nigeria are characterised with varying landscapes which includes riverine as well as the upland settlement. However, little studies exist on the cultural landscape transactions of the Nupe communities. More also is that tourism potentials of communities are enhanced through the understanding of how indigenous communities perceived their landscape. As such this research embarked upon a qualitative documentation of cultural landscape values of some selected Nupe communities in Central Nigeria which include Bida**,** Kutigi, Nupeko and Patigi local government in Niger and Kwara States respectively. This involved participants observations as well as the conduct of interviews on resident of selected riverine and upland Nupe communities. In the exploratory study, elicitation of data laid emphasis on both built and unbuilt features of the cultural landscapes which were perceived as valuable to the residents. The finding showcases a plethora of cultural landscape values of Nupe communities with inherent tourism potentials.

Key words: Cultural landscape, Heritage, Nupe, Space, Tourism

INTRODUCTION

Cultural landscape is about people's interactions with nature that surrounds them and in such transactions cultural values which are uniquely characterized are constituted (Muhammad 2017; Stephenson, 2010). As such cultural landscapes do hold the memories of long relationship of human and environment. This relationship does communicate the continuity of human evolution associated with natural environment. It therefore suggests that the physical character of the environment and how people interact with nature becomes an important tourism resource with inherent benefits in the development of any nation's economy. (Okhiria, Adebayo, & Usdame 2014). As such cultural heritage and biodiversity has become an increase phenomenon for the tourist attraction to destinations (Cobbinah, et-al, 2017; Khoshtaria & Chachava, 2017). The need for economy diversification and transformation has led government of various nations to key into the tourism sector as a valuable instrument for alternative development process. (Honey and Gilpin 2009). More also, tourism has been recognized as one of the key feature of major socio-economic activities in the world. The world tourism organisation (WTO) buttressed tourism as a key driver for social, and economic progress of the world. However, there is a wide gap between the tourism potentials and actual performance as most of the tourism resources are still left untapped. (King 2002). One of such untapped tourism resources is cultural landscape tourism especially in developing countries such as Nigeria.

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Culture and tourism have a unique and beneficial relationship which can increase the importance and attractiveness of region and other countries at large.(Franklin, 2015).Culture is an important key factor for tourism development which also manifest into a distinct global market place (Chidozie, 2014).By and large, tourism provide an important means of achieving cultural value, heritage and creativity leaving a strong relationship between tourism and culture, with an added value to various tourist's destination.

Nigeria is physically vast with abundant landmark of about 932.768 sqm with a total coastline of 853km and human demographic population of over 160million as at year 2006 census. This is a future which develop Nigeria as one of the most social and rich in cultural diversity in Africa having over 250 major and minor ethnic groups among which the major languages are Hausa, Igbo, Yoruba, and other minor ones notably Fulani, Kanuri, Tiv, Edo, Ibibio Igala, Ebira, and Nupe and many others (Adedayo, Oyun, & Kadeba, 2010). These by implication implying that hundreds of cultures with individual unique characteristics (Bankole, 2013). As such it behoves that the tourism potentials of these cultural landscapes are studied especially the minority ethnic group such as the Nupes located in central Nigeria

This research therefore, purposively explored the rich cultural tourism potentials created by cultural landscape transactions of some selected riverine and upland communities of Nupe Kingdom in central Nigeria. More also is that the Nupe people have been identified with rich cultural landscape values but without much documentations of the tangible tourism potentials of the cultural landscapes (Muhammad & Said, 2015). More also is that the mapping of the cultural landscape tourism potentials will attract tourists to the area and create more job opportunities to indigenous people.

Culture Heritage and Tourism

Cultural landscape is a manifestation of a collective wane of nature and manmade ideologies that showcase the transformation of human and its environment with an association of environmental advantages and social constrains concerned by the natural sources (UNESCO, 2012). Cultural landscape is about the physical characteristics of the environment and the collection of objects which constituted the appearances of the environment (Olayiwola, Ajala, & Sangodipe, 2014). While heritage in relation to tourism can be categorized as either cultural heritage or natural heritage. Heritage may be understood as a form of history, ideologies or belief customs and values, art and music and even the standard of living of a societal setup. While that of natural heritage can be traced to mean a landscape of a place in which people find themselves. Heritage can also refer to as instrument in determining the economic cultural or social value, which stands to be the concept that makes heritage an interpretation of history, (Gunery, 2008). This shows that heritage is a vehicle of thought in which people's beliefs translated into physical form and can be enjoyed by others.

As such, in cultural landscape tourism, man becomes the key player and central point of tourism activities, as such the unique transactions of each culture with their landscape become an avenue for enjoyment by others. In Nigeria, tourism sector has been neglected, until in recent times, and still, the development and the studies are still in its infant stage (Tunde, 2012). Several efforts by the government have been in piecemeal, hence, the need for documentation of cultural landscape more especially, that of the minority ethnic groups such as the Nupes in central Nigeria.

Cultural heritage is an integral elements of unique cultural tourism destination which consolidate the cultural values of that make those features and the immediate environment on historic and valuable place for tourism (Vanice, 2000). The establishment of cultural tourism is a vital tool which amend at consolidating the relationship between culture and tourism thereby improving the socio-economic value of a cultural setup. (Shismonova, 2006). Modern tourism development has a limitless challenge but only required some basic tourism features and infrastructures like scene instruction, placing weather, accessibility and even accommodation to facilitate the process and the character of stay. Most of these features are products of a cultural landscape and heritage of a place. It means that tourism in reciprocation should serve as a promotion and preservation of culture and historical elements. (Kraster, 2005). It therefore means that, a carefully located tourism destination with a good managerial policy within a settlement characterized with varying cultural landscape increases the value of the tourism activities.

Study Area and methodology

The study area includes the famous Nupe communities with rich and historical lyrics and trace of tangible and intangible cultural factors, this communities cut across Niger, Kwara and Kogi state as shown in Figure 1.0. While the method adopted for the study dwells more on descriptive survey and written documents, personal observation and participation alongside with in depth interview with district head of various settlement and communities was carried out within the selected Nupe communities. Data's were collected based on the research question and interview guide administered orally, data collected were in Nupe language through mobile voice recorder, a digital photo camera was also used to capture some relevant images, the data were carefully translated to English language, and the photographs of the unique features were used to explain some of the tangible cultural landscape.

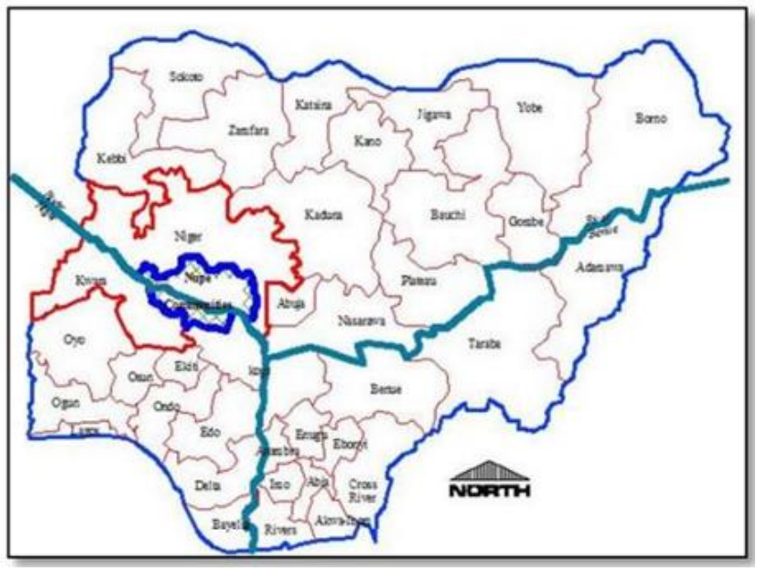

Figure 1.0: The Nupe Settlement Within Niger Kwara and Kogi state In Central Nigeria.
Source: Muhammad 2017.

The Nupe Settlement

The Nupe and their settlement are regarded to have been in existence since the early 13th and 14th century with a define and unique cultural characteristics. (Sarki 2010). The communities are in the central part of Nigeria notably along the lower basin of River Niger and Kaduna (Muhammad 2017, Nadel, 1969). The Nupes settle in large villages called (*Ezhi*) and a small settlement known as (*Kangi*) the settlement pattern of Nupe communities are characterized with cluster compounds consisting of members and series of un-walled compound, (*Gwalazhi*) entrance halls (*Katamba*) forming a home stead (Emi). The collection of houses (*Emizhi*) to form a ward or (*Efu*) as in the case of big settlement the wards are separated by stretches of open spaces, land or farms which come together to form a village, the collection of two or more neighbouring village is known as (*Ekkah*) (Muhammad 2017).

The study communities

The study communities include the famous ancient nupe towns with unique cultural landscape and heritage, this include Bida, kutigi, Nupeko, in Niger state and Patigi emirate in Kwara state. Bida is the capital of nupe kingdom rich of cultural and historical monuments, art and craft tourism centres as shown in table 2, such as *Masaga* brass factory, *Tswatamukun* aluminium craft centre and *Dokodza* blacksmithing and warfare manufacturing centre, Nupeko is the first founding place of nupe settlement, Kutigi the capital of Lavun Local Government, with rich and unique culture inherited from Sudan (*Ganni kutigi*). and Patigi the second resettled home of Nupe settlement in Kwara State after the Fulani jihad, with tourism potential at the confluence of River Niger and Kaduna and famous Regatta festival which always brings the surrounding Nupe communities together.

Figure 1.: The Remain of Town Fence Wall
Source: Authors Field Work 2017.

Figure 2.: The Antient City Gate (Ebban) At Bida
Source : Authors Field Work 2017.

Table 1. The Historical Site in Nupe Community as Tourism Potential

S/ No	Historical and Tourism sites	Location	Remark
1.	Massaga Brass and Glass Melting Centre	Bida town	Partially developed
2.	Twata Mukun Alluminiun Craft Centre	Bida town	Partially and locally developed
3.	The Ancient City Gate and Remain Of Massive Town Fence	Bida town	Existing but gradually eroding

4.	Dokodza Warfare and Metal Fabrication Centre	Bida, and patigi	Existing and partially developed locally
5.	The First Nupe Settlement Town	Lavun local government (Nupeko village)	Existing with rich nupe architectural tradition, materials and decorative features
6.	The Confluence of River Niger And River Kaduna	Lavun/ patigi local government in Niger and Kwara state respectively	Existing but site not developed to enhance tourism activities
7.	Various Settlement Pattern And Unique Architecture Of Upland And Riverine Communities	Bida, Lavun and Patigi local communities	Existing and partially developed through community and self-efforts

Table 1 shows the potential tourism site in Nupe communities dominated in the capital and ancient town of Nupe Kingdom (Bida). While Patigi, Kutigi and Nupeko also possesses few of the sites. The result on the table revealed that most of those tourist sites were partially developed locally through individual and community effort except that of the ancient city gate and town fence wall which is gradually eroding due to urban expansion and constant urban renewal by the government.

Table 2. Festival and Ceremonies in Nupe Communities

S/ No	Festivals	Location/Venue	Remark
1.	Annual fishing festival	Patigi, Nupeko, Muregi and Gbaradogi	Still holding with little or less popularity
2.	The Mega Patigi Regata Festival	Patigi	Still holding but Gradually eroding with insufficient government intervention
3.	Ganni Kutigi	Kutigi	Still holding annually without government intervention
4.	Annual Masquerade Display	Patigi, and its Environs	Still holding with no government intervention
5.	Eyazhe (The Famous and Annual Nupe day)	Rotational among famous Nupe town	Still holding annually with partial government intervention

Table 2 shows the annual festival in Nupe kingdom with Patigi having the highest festival and event as it shows most of the occurrence. Although, Bida and Kutigi are also not left behind as the Mega festival (Eyazhe and Nupe day) is on rotational basis among Bida, Patigi, Agaie and Lapai emirate. The annual Regata mega festival which also feature masquerade display and offers the exhibition of the craftworks and trades takes place at the river bank of Muregi and Gbaradogi of Niger and Kwara State respectively.

Table 3. Trade and Activities of the Nupe people

S/ No	Trade and Activities	Location/Venue	Remark
1.	Spinning	Bida, Kutigi, patigi and Nupeko	Can be found in the circular bedroom of old woman
2.	Dying	Kutigi, Agaie and Bida	Existing
3.	Sculpturing (Egba)	Bida, Gbako	Bida kutigi and patigi and their sub urbans
4.	Hair platting	Bida, Lapai, Kutigi	Still existing in all Nupe communities
5.	Leather and Tyranny	Bida and patigi	Found in ancient Bida and Patigi resident of the inherent professionals
6.	Straw art making (Zongu and Marufa)	Bida, Agaie, Patigi, Nupeko	In the rural settlement of Nupe community
7.	Blacksmith (Tswachi and Gbagba)	Bida, Patigi and local environs	Mostly Found mostly in Bida and other famous Nupe towns

Table 3 reveals that Nupe people are rich in trade, art and craft work, which is dominantly applicable to almost all the upland and the riverine communities, but dominant operation of this can only be appreciated among the rural communities. Although, there is still trace of the established centres in the inherent sub palaces *(katamba)* of their title holders such as *Majin Kimpa, Masaga Nupe, Gbagba, Sokyora Gozan,* in their respective emirate especially Bida and Patigi. The exhibition and competition among the experts do add value to the festivals and ceremonies in Nupe Kingdom as the key element of tourism attraction. All these activities add value to the festivals and ceremonies and offers people within and outside, far and near to interact with each other and global world at large.

Architecture of Nupe Settlements

A typical Nupe community consist of many round huts built of clay (*Eggun*) and vegetable or mineral fibre called *Dongoh* (Thatch) and surrounded by a high mud wall in most cases or vegetable basket weaved pattern of vegetable *Tsara* fence. However, new building materials such as galvanised iron roofing sheet could be seen to have replaced the use of thatch in roof covering as shown in Figure 3. Nonetheless, a prominent character of the Nupe compound is that it is comprised of several blood related nucleus families living together into form a large compound. Each of these compounds are headed by the eldest male family member called *Emitso* (owner of the house). Each of these small family units are identified through several rooms facing a courtyard.

Figure 3.: A Typical Nupe compound Source*:* Authors Field Work 2017.

The Nupe system of buildings are characterised with round entrance hall, constructed using sun-dried mud bricks conical in shapes, mud mortar and mud plaster mostly found in the villages.

Cultural Landscape of Nupe Community and Tourism

Nupe people's life style and cultural transactions are shaped by two prominent landscape types, the upland and the riverine. The riverine Nupes are called *Kydya* while the upland Nupes are called *Kintsozh*i.

The Upland Nupe communities

These are Nupe settlements characterized with flat, deeps as well as hilly and mountainous landscape. They are those which are a bit far away from the river banks. The landscape type offers them (*Kintsozhi*) the opportunity of cultivating staple crops like millet, guinea corn, yam, upland rice, groundnuts, cassava and sweet potatoes. The location and landscape of these area offer *kintsozhi* the unique architectural styles which also distinguishes them from the *Kydya*. These two types of landscape characters as illustrated in Figures 4 and 5 also influences the nature of traditional occupation of the nupe people.

Figure 4. Cultural Landscape of Upland Rural Nupe Community;
Source : Authors Field Work 2017

The upland nupe settlements are mostly found to cultivate cereals such as millet, maize, cassava and rice on the flood plains, while the Kydya are found to engage in fishing as a source of occupation.

The Riverine Nupe Community Cultural Landscape

There are a lot of Nupe communities that are located along the boundaries of River Niger and River Kaduna. They include communities like *Bachita, Jebba, Ketso, Lalagi, Muregi, Egagi, Nupeko and Nku . similarly, Katcha, Baro Kippo , Tsonga, Lafiyagi, Lipkata and Chewuru* are also Nupe communities whose daily transactions are linked to the riverine landscape. It is to be noted that Nupe communities cultural landscape boundary extend to include Kwara, Niger and Kogi States.

Figure 5. The Settlement and Cultural Landscape of Riverine Community- Nupeko Village Niger State

The floods in riverine Nupe communities allows for a greater emphasis on rice cultivation, fishing, and sugarcane cultivations. The large-scale cultivation of sugarcane has led to the establishment of commercial growing and raging of *Bachita* sugar company.

The seasonal floods come with its inherent challenges on the architecture of the riverine communities. However, over time the Nupes have adopted some coping strategies such as the used of wooden frames which are then covered up with mud. When the flood comes, it only washes away the mud and leaves the wall frames and the roof intact. The flood for the riverine Nupes is - that which brings riches and not as a disaster. The flood brings in rich organic soil for the cultivation of rice and sugarcane as well as fish.

Special Art and Craft of Nupe community

After the line of the Jihad of Usman Dan Fodio in 18th Century. The main form of artistic expression includes spinning, weaving, dying, sculpturing and hair dressing by the women, other art form includes leather and ternary works (*Kimpa*) Straw art making (*Marufa*) hair dressers (*Gozan*) black smith (*Tswachi*) and Wood Carving (*Egba*).

Masaga Glass and Glass Beats Centre

This is also another form of art and craft representing the occupation of Nupe community, it is a famous art and craft centre where glass and glass bottles are as a raw material, are melted to form other unique art and craft products, such as male and female beats, local bangus, cooking utensils and other forms of artistic and decorative glass products; one remarkable thing that characterized the centre to be an historic one is that till date it's the only local art and craft centre situated in Bida and course to work which males use it for at any other different locations, People within and outside the country do visit the centre to appreciate the unique local technology.

Aluminium and Brass Art and Craft Centre (Tswata Mukun)

This is one of the famous art and craft centre in the ancient town of Bida, founded since the reign of King Usman Zaki, they are made up of a circular traditional Nupe house forms that house the manufacturing process of aluminium products; it has been a tourist centre as people both far and near do visit to appreciate the process and the uniqueness of end product produced such as aluminium spoon (Kpantoro) brass pots, aluminium cooking utensils and other forms of decorative products as shown in Figure 6

Figure 6.: Nupe Ternary and Blacksmithing as The Major Art and Craft. Source: Authors Field Work 2017.

Festival and Ceremonies

Ceremonial event is a key event in the social life of the Nupe People (this include wedding, naming, coronation of new chief's Islamic school graduation, church events, sallah festival, and other traditional related events. this create a greater opportunities for people living far and near, for commercial transaction such as buy and sell of farm products, art and craft products, event exhibition, cultural demonstration and celebration, and above all offers them a greater opportunity to interact socially with outside world thereby creating an avenue for cultural exhibition, this tend to attract people from other places to witness the event; this alone by extension can be traced as the origin of tourism activities in Nupe kingdom.

Patigi Regata festivals

The Patigi regata festival is one of the Nupe famous festival that connect other minor festival and cultural display among other riverine Nupe communities. The origin of the festival can be traced back to 1953 during the reign of late Etsu Jimada of Patigi, the festival features all kind of Nupe cultural display such as Swimming, masquerade, (*Gboya*) and canoe padding competition among the Nupe communities of Kwara, Niger and KOGI. It is a colorful colorful and mega festival that brings together all other cultural affiliation to Nupe tradition. This include.

General Horse Riding

This is a festival that feature all the emirates of Nupe kingdom chosen from Bida, Agaie, Lapai, from the upland area and Patigi, Tsonga, Lafiagi, on the riverine communities.

Canoe Peddling Festival & Swimming

It is another cultural display among the settlement on the river bank such as Muregi, Ela, Likpata, Gbaradogi, Chewuru Ketsho, Lalagi and Guzzan etc. It offers the young swimmers and the old fishermen to display their talent in the form of competition there by offering prizes to the deserving communities.

Figure 7: The Regata Festival Canoe Padling And Dancing Competition
Source: Authors Field Work 2017.

The Masquerade Display

It's a display by the nupe masquerade (*Gboya*) which is a tall cylindrical masquerade usually decorated with textile material (Muhammad 2017). they operate and display in response to the traditional drum with movement in a curvilinear and circler motion as show in the figure below this form of cultural transaction which are found among the upland communities like, Zambufu, Lade Gbaradogi and Nuwakota.

The upland festival are the traditional event that do take place and hosted among the communities of upload settlements the notable ones among them are Ganni kutigi festval Ebiko festival in Gbako and Eyazhe in Bida local government.

Figure 8: Masquerade Display At Regata Patigi Annual Festival;
Source: Authors Field Work 2017.

Ganni Kutigi Annual Festival

Ganni kutigi is an annual festival usually celebrated by the people of Kutigi and other neighboring communities usually in the third month of Islamic calendar. It is a giant festival that attract people from different part of the country usually celebrated within a time frame of three days with different events ranging from cultural drum display, traditional boxing competition among the young men, and dancing competition such as zannabi dance, Ta'aka dance, and Guguyagi masquerade of Kutigi land.

Figure 9: Zannabi Dance At Gaani Kutigi Annual Festival
Source: Authors Field Work 2017.

But one remarkable thing about the festival is that it does not end without the recitation of the holy quran which is the central focus of the festival. The festival was ranked to be one of the important as it serve as revenue to foster unity among them and also a means of settling dispute in the land.

Nupe Day and Eyazhe

This usually takes place in Bida the capital of Nupe kingdom in the first month of Islamic calendar usually last for two days, the day one which is known to be fire night (*woriwo* or *nanvun*) and the second day which is the fun fare where the king and other traditional title holders comes out immerse to celebrate on horse riding (*Dubbar*).

Figure 10: Horse Riding At Nupe Day Festival (Eyazhe) At Bida. *Source: Authors Field Work 2017.*

People come to witness this colourful event from far and near one its quite noted that the festival is one that connect all the Nupe communities of both the riverine and the upland communities, its strong and unique affection gave rise to its modification and upgrading to become the famous Nupe day which is usually celebrated annually among all the Nupe communities in central Nigeria.

CONCLUSION

The tourism potentials of cultural landscape of Nupe communities is unique, very rich and fascinating, in both upland and riverine settlement. The cultural values and tourism potentials of the settlements (upland and riverine) are shaped by the individual landscape types. The consequence of which is seen in the social, economic and cultural activities of the indigenous Nupe people. These cultural transactions include Architectural styles, historical sites and values the communities in both tangible and intangible forms. Some of these values are portrayed in special art and craft which include spinning, dying, sculpturing and platting of hair popular among them is known as (*Shikku*) which are mostly practiced by the females. While their male counterpart engaged in leather and ternary works *(Kimpa*) straw art making (*Marufa*) hair dressing (*Gozan*) black smith (*Tswachi*) wood carving (*Egba*), farm implement and war fare tools and weapons (*Dokodza*).. Similarly, the Nupes do also have festivals and ceremonies that have the potential to attract tourist, this includes masquerade dance, horse riding and wrestling. The foregoing therefore showcases the rich cultural heritage of the Nupe community in both tangible and intangible forms and thus provides an avenue for tourism. It is therefore recommended that the tourism should shift from the limited focus on tangible values such as scenic beauty to also include the promotion of the intangible values which are imbedded in the cultural landscape transaction of the people.

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SPATIAL INEQUALITY IN ENVIRONMENTAL AMENITIES DISTRIBUTION IN BIDA, NIGER STATE, NIGERIA.

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Environmental amenities is a bundle of services that is important to individual existence, it could as well determine the wellbeing of the people. Spatial inequality in environmental amenities can undermine social and political stability due to the tensions and conflicts that they often engender. Therefore, this study examines the spatial inequality in the environmental amenities distribution in Bida, Niger State. Environment inequality in five (5) environmental amenities was assessed, the amenities are: school, water, health facilities, tarred road and open space. Both primary and secondary data were collected for the study, and the data were analysed descriptively. Gini coefficient and Lorenz curve were employed as analytical tools to measure inequality and adequacy in the fourteen wards in Bida. The study reveals that there is a high unequal distribution (0.46) in environmental amenities distribution in Bida. There is variation in inequality among the identified amenities; Public School recorded the highest inequality index of (0.59), while public primary health care and open spaces recorded an inequality index of (0.57) and (0.54) respectively. The study, therefore, concludes that the provision of environmental amenities in the study area is not a function of population or area coverage, except for water and schools. It is recommended that the provision of environmental amenities should be matched with the population, review of policy and other objective criteria to improve general wellbeing of the people.

Keywords: Environmental Amenities, Inequality, Gini-Coefficient Lorenz Curve

INTRODUCTION

There is a growing concern that spatial inequality is on the increase, globally and locally (UNDP, 2013). Infrastructure facilities are not evenly spread over space because of environmental factors. In recent years there is a global attention for the need to tackle inequality. Beyond the adverse implications of inequality for growth and wellbeing, spatial inequalities can undermine social and political stability due to the tensions and conflicts that they often engender (Stewart, 2010). Understanding and redressing the underlying drivers of spatial inequality is therefore critical both for preventing political instability and for maximizing the poverty reduction impact of economic growth. Recent studies have shown that, other than parks, green space, vegetal land, usually for recreational or aesthetic purposes, has also been recognized as an important neighbourhood amenity. Access to green spaces has been viewed as a principal factor to enhancing health and well-being (Li et al., 2010; Thompson et al., 2012). Inequality is far from being a temporal phenomenon, inequalities has remained a global reality, which has widen in many countries in recent years (Asian Development Bank, 2012).The phenomenon of inequality is widely recognized in Nigeria and many countries of the world. Inequality is epitomized in the use of such terms as 'advantaged' and disadvantaged' 'privileged and less privileged'. (Adefila and Bulus, 2014).

The importance of environmental amenities to human life can never be over-emphasized (Ogundare, 1982) cited in Sanni (2010). Researchers have likened environmental amenities to bundle of services, for instance Stewart and Srinivasan (2004) noted that environmental amenities are goods and services whose absence in the consumptions of a household, render the household poor.

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Mohammed, et al., (2018). **SPATIAL INEQUALITY IN ENVIRONMENTAL AMENITIES DISTRIBUTION IN BIDA, NIGER STATE, NIGERIA.** Contemporary Issues and Sustainable Practices in the Built Environment. School of Environmental Technology Conference, SETIC, 2018

Stewart and Srinivasan (2004) maintained that the concern and attention that any government pays to environmental amenities could well determine the well being of the people. Empirical studies in both developed and developing countries have linked increasing avoidable and preventable deaths to inadequate access to environmental amenities (World Health Organisation, 1998).

In investigating the level of provision of central facilities, emphasis has shifted from mere provision to the degree of accessibility of people to these facilities. Barton et al., (2009) echoed this emphasis in their observation that "human being are the centres of concern for sustainable development and they are entitled to a healthy and productive life in harmony with nature". Thus, a deficiency in the spatial distribution of the consumption of goods that are non-economic in nature is often neglected with the consequences of overlooking vital areas of differences in the quality of human welfare (Sanusi, 2007). Even where some analysts focus on spatial inequality, the attempts is to examine economic inequality as it differs from one place to the other without necessarily laying reasonable emphasis on consumption of certain amenities that relate to individuals within the society(Smith, 1979) cited in (Sanusi, 2007). The inundated focus on income inequality could partly be attributed to the common interpretation of poverty has always been on income which has universally acceptable threshold. However, in recent times, poverty has been seen as a multi-dimensional (UNDP, 2013), the definition should therefore, encompass these dimensions. To better appreciate inequality, attention should also be diversified and effort be made to focus on other aspects of poverty apart from income.

The problem of poverty becomes very worrisome, when considered within the context of inequality. This worry even becomes sensitive when the amenities with which households interact daily are taken into consideration. It is not unexpected, therefore, that the World Social Situation Report 2013 is titled; inequality matters (UNDP, 2013) with emphasis on Economic and Social Affairs. Owing to this, it is the intention of this research to identify environmental amenities and assess spatial inequality in relation to consumption of some environmental amenities in Bida, Nigeria. The working definition for environmental amenities in this study is stated thus "Environmental amenities are amenities or facilities available to households within and around their houses. They ·are· consumed directly or indirectly by households on a daily basis. The presence of these facilities adds to the comfort and general welfare of the households". The environmental facilities considered for this study are open spaces, access roads (tarred), public primary schools, public bore holes, and public primary health care centres within the geographical boundaries of Bida, Niger State.

Concept of Spatial Inequality

Spatial inequality is terminology used by urban planners to offer explanation about how phenomenon of interest is or is spread over space. Many authors present different argument about what inequality entails in various ways but certain things are central to all. For instance Sanusi (2007) argued that "Inequality is a situation of unequal possession of certain distributive amenity and demonstrates unequal gradients in the distribution continuum". He further noted that within this continuum, "while few people may not have at all, too many people may have too low and very few people may have too much". Thus, inequality represents a discernible imbalance in the relationship between people in respect of a particular subject. In related development, inequality has been referred to as a "condition in which different spatial or geographical units are at different levels on some variables of interest usually average income" (Lall and Chakravorty, 2004).

Spatial inequality is also viewed as "uneven distribution of economic and social indicators of human wellbeing within or among geographical units such as countries, cities, rural-urban areas and regions" (Aryeetey et al., 2009) cited in Poku-Boansi and Amoako work (2015). The author's perception about spatial inequality dwelled more on socio-economic state of wellbeing and condition relating a geographical unit and not the mere measurement and comparison of indicators depicting those states. In view of this, it is safe to view spatial inequality as the state of lop-sidedness in the distribution, possession, access and satisfaction derivable from phenomenon of interest under investigation.

Concept of Environmental Amenities

In environmental economics, an amenity is something considered to benefit a property and thereby increase its value (Carmichael, 2003). Carmichael classifies amenities in two; tangible and intangible amenity. Tangible amenities can include the number and nature of guest rooms and the provision of facilities such as elevators (lifts), wi-fi, restaurants, parks, communal areas, swimming pools, golf courses, health club facilities, party rooms, theatre or media rooms, bike paths or garages, while intangible amenities can include aspects such as well-integrated public transport, pleasant views, nearby activities and a low crime rate. Within the context of environmental economics, an environmental amenity can include access to clean air or clean water, or the quality of any other environmental good that may reduce adverse health effects for residents or increase their economic welfare (Barry and Martha, 2017).

Sanusi, (2007) on the other hand argued that environmental amenities are "facilities available to households within and around their houses. They ·are· consumed directly or indirectly by households on daily basis". The presence of these facilities adds to the comfort, joy and general welfare of the households. He argued further that among these facilities are "open spaces within housing units, habitable rooms, the size of the dwelling unit, the average size of rooms, the number of rooms with cross ventilation, number of toilets available to households, the distribution of bathrooms and kitchen among households". It is important to note that living standard is measurable, because socio-economic status of the people to a large extent depends on the quality of infrastructural facilities provided with good maintenance culture.

Amenities affect everyone in an urban area (Sanusi, 2007). Terry (2002) went further to categorize amenities into two. These are: (i) Natural physical amenities (climate, humidity, temperature, water access overall natural attractiveness), and (ii) Constructed amenities: this include number of bigger institutions like research libraries, museums, small firms, bookstores, juice bars, bicycle events to mention but a few. In related development Idachaba (1995), further categorized amenities into three (3), namely: (i) Physical Infrastructures which comprises of Roads, Bridges, storage facilities, Dams, Irrigation, water facilities and other forms of processing facilities, (ii) Social infrastructure which include health, medical facilities, and educational facilities, (iii) Institutional infrastructure which consists of cooperative societies, unions, financial institutions like Banks, Agricultural extension and training services.

Inequality Measurement

Several inequality measurements exist; Coefficient of variation, Gini coefficient, Theil Index, generalized entropy, and Atkinson index. The three (3) most widely used index of inequality, Coefficient of variation, Gini coefficient, and Theil Index were discussed in this study.

Coefficient of variation (CV)

This measure of income inequality is calculated by the dividing the standard deviation of the income distribution by its mean (Campano 2006) More equal income distributions will have smaller standard deviations; as such, the CV will be smaller in more equal societies. Despite being one of the simplest measures of inequality, use of the CV has been fairly limited in the public health literature and it has not featured in research on the income inequality hypothesis. This may be attributed to important limitations of the CV measure: (1) it does not have an upper bound like the Gini coefficient, making interpretation and comparison somewhat more difficult; and (2) the two components of the CV (the mean and the standard deviation) may be exceedingly influenced by anomalously low or high income values. In other words, the CV would not be an appropriate choice of inequality measure if the study's data did not approach a normal distribution.

Atkinson index

Unlike the Gini coefficient, Atkinson index of inequality measurement is a more precisely labelled family of income inequality measure. The Atkinson index allows for varying sensitivity to inequalities in different parts of the distribution. This was important to Atkinson, who was concerned with the inability of the Gini framework to give different parts of the income spectrum varying weights. In his influential text The Economics of Inequality, Atkinson noted that inequality "cannot, in general, be measured without introducing social judgements. Measures such as the Gini coefficient are not purely 'statistical' and they embody implicit judgements about the weight to be attached to inequality at different points on the income scale". Therefore, his index incorporates a sensitivity parameter (ε); which can range from 0 (meaning that the researcher is indifferent about the nature of the income distribution), to infinity (where the researcher is concerned only with the income position of the very lowest income group). Atkinson argued that this index was a way to incorporate Rawls' conception of social justice into the measurement of income inequality.

Gini coefficient of inequality

The most widely used single measure of inequality is the Gini coefficient. It is based on the Lorenz curve, a cumulative frequency curve that compares the distribution of a specific variable (e.g. income) with the uniform distribution that represents equality. To construct the Gini coefficient, graph the *cumulative* percentage of households (from poor to rich) on the horizontal axis and the *cumulative* percentage of expenditure (or income) on the vertical axis. The diagonal line represents perfect equality. The Gini coefficient is defined as A/(A+B), where A and B are the areas shown on the graph. If A=0 the Gini coefficient becomes 0 which means perfect equality, whereas if B=0 the Gini coefficient becomes 1 which means complete inequality. One of the major advantages of Gini Coefficient over other forms of inequality measurement are; direct comparison between units with different size population feasible as well as intuitive interpretation.

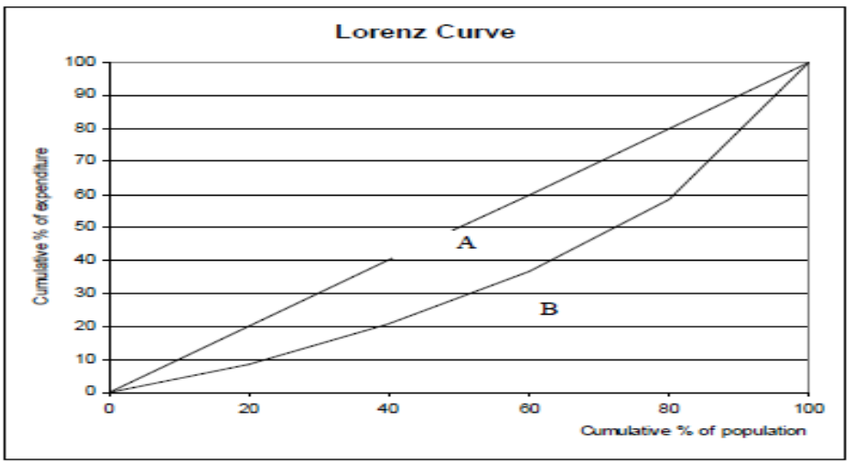


Figure 1: Lorenz Curve

RESEARCH METHOD

The study is an empirical study, it is a non-experimental research using survey. Qualitative and quantitative data were gathered from primary and secondary data source. The geographical location of the environmental amenities was collected with the aid of a geographical positioning system (GPS), except open space and tarred road. The area coverage of the open space and the length of tarred road were captured from high resolution image of Bida acquired from Ikonos. The location (latitude/Longitude) of the identified environmental amenities were imported into ARCGIS 10.2 environment and mapped appropriately. The study also collected the projected ward population of Bida wards from the Malaria Consortium (2016). Gini-coefficient and Lorenz curve was adopted as analytical tool to measure inequality in the distribution of the environmental amenities. The data analysed were presented in tables and maps for easy understanding and interpretation.

RESULTS AND DISCUSSION

Distribution of Environmental Amenities

Distribution of Schools in Bida

Table 1 shows the number and distribution of public primary schools in Bida. The result shows that a total of 55 public primary schools were identified in Bida. The result shows that the largest proportion (15%) of the public schools in Bida is located in Nasarafu and Umaru Majigi B ward respectively. The result also reveals that the lowest proportion (4%) of the schools was identified in Masaga A, Masaga B, and Cheniyan ward respectively. Out of the fourteen wards, four wards (Nasarafu, Umar Majigi B, Landzu and Umar Majigi A) share 52% of the total number of schools identified in Bida. This is an indication of inequality in the distribution of primary schools in Bida.

The spatial distribution of public schools in Bida is presented in Figure 2. The result shows a cluster distribution of public schools within the city core. The pattern of public school distribution also shows that the number of public schools decreases with increase in distance away from the city centre. Wadata, Dokoza, Cheniyan and Bariki ward have fewer numbers of public schools compared with wards closer to the inner core. Generally, the pattern of public school distribution in Bida is cluster.

Table 1: Distribution of Public Primary Schools in Bida

Ward	Schools	Percentage
Bariki	4	7
Cheniyan	2	4
Dokoza	3	5
Kyari	2	4
Landzun	6	11
Masaba A	3	5
Masaba B	2	4
Masaga A	2	4
Masaga B	3	5
Mayaki Ndajiya	3	5
Nasarafu	8	15
Umaru Majagi A	6	11
Umaru Majigi B	8	15
Wadata	3	5
Total	**55**	**100**

Source: Authors Survey (2017)

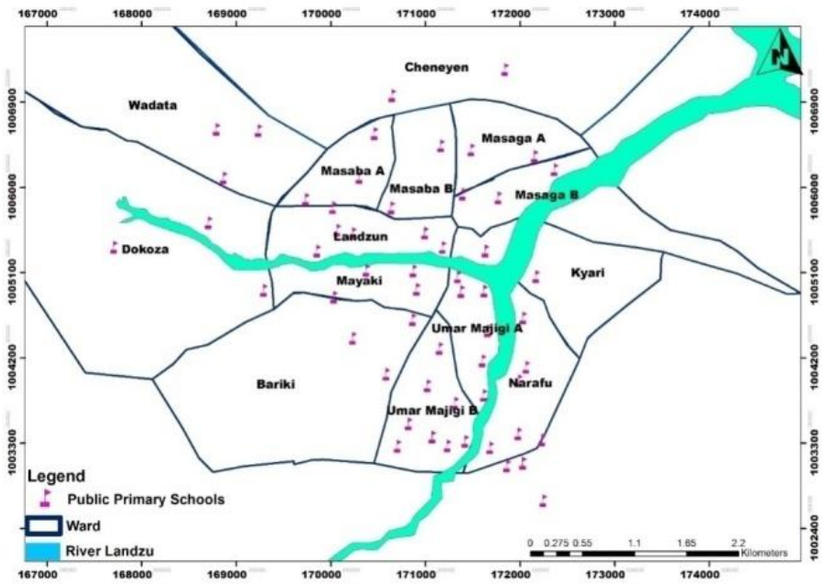


Figure 2. Spatial Distribution of public Primary Schools Source: Authors Survey (2017)

Distribution of Primary Health Care Centres in Bida

Similarly, the number and distribution of primary healthcare centres in Bida is depicted in table 2. A total of ten (10) Primary Health Care (PHC) was identified in Bida. Wadata ward has the largest proportion (20%) of PHC facilities in Bida. Eight other wards enjoy 10% of the PHC respectively; the wards are Dokoza, Kyari, Masaba A, Masaga A, Masaga B, Mayaki, Nasarafu and Umaru Majigi B. All other wards have no record of primary health care centres. The wards without records of PHC are Bariki, Cheneyen, Landzu, Masaba B and Umaru Majigi A. The spatial distribution pattern of public healthcare centres in Bida is depicted in Figure 3. A dispersed pattern of distribution can be observed from Figure 3, which implies a random distribution pattern in the distribution of primary health care centres in Bida.

Table 3: Distribution of Primary Health Care Centres

Ward	PHC	%
Bariki	0	0
Cheniyan	0	0
Dokoza	1	10
Kyari	1	10
Landzu	0	0
Masaba A	1	10
Masaba B	0	0
Masaga A	1	10
Masaga B	1	10
Mayaki Ndajiya	1	10
Nasarafu	1	10
Umaru Majigi A	0	0
Umaru Majigi B	1	10
Wadata	2	20
Total	**10**	**100**

Source: Authors Survey (2017)

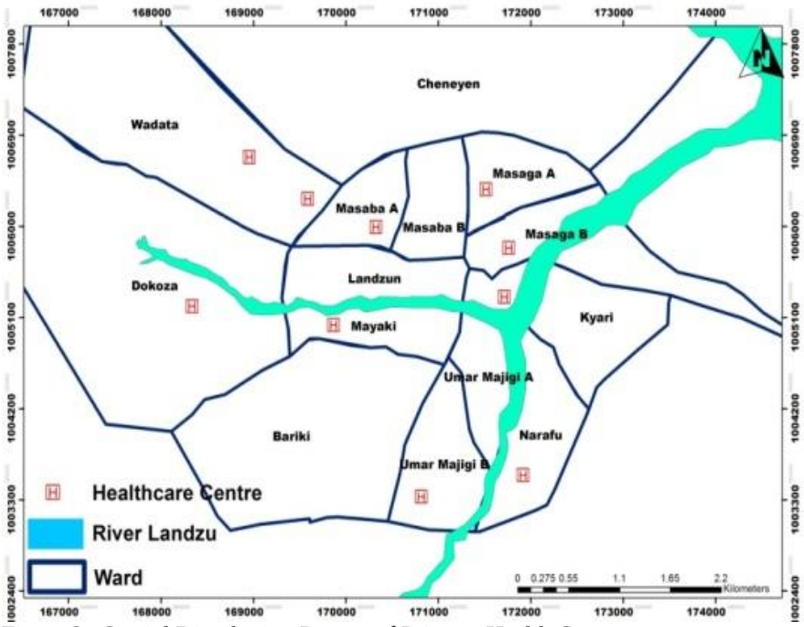


Figure 3: Spatial Distribution Pattern of Primary Health Centres

Distribution of Public Bore hole in Bida

Furthermore, the number of public boreholes identified in Bida is presented in Table 3. The result reveals that a total of twenty four (24) public boreholes were identified in Bida. All the wards have at least one public water facilities (Motorized and Manual borehole) except for Masaba A and Umaru Majigi A. It can be observed that Dokoza, Masaga B and Kyari has the largest percentage (13%) of public water facilities in Bida respectively. The lowest percentage of public water facilities is recorded in Masaba B, Nasarafu, and Umaru Majigi B with 4% respectively. The result also shows that 39% of the public water facilities is shared by three wards: Dokoza, Masaga and Kyari, while the other eleven (11) wards share the balance of 61%.

Figure 4.Shows the distribution pattern of public borehole within Bida. The result shows that the distribution of the public water amenities is random. It is also observed that the water points are clustered within some areas of the wards, while other areas are far further away from the amenity.

Table 3 Public Water Facilities in Bida

Ward	Number	Percentage
Bariki	2	8
Cheneyen	2	8
Dokoza	3	13
Kyari	3	13
Landzu	2	8
Masaba A	0	0
Masaba B	1	4
Masaga A	2	8
Masaga B	3	13
Mayaki Ndajiya	2	8
Nasarafu	1	4
Umaru Majagi A	0	0
Umaru Majigi B	1	4
Wadata	2	8
Total	**24**	**100**

Source: Authors Fieldwork (2017)

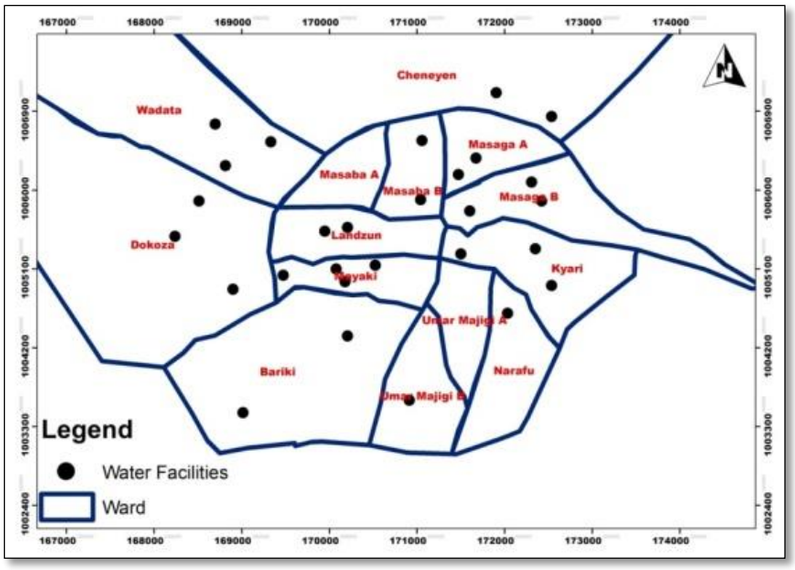


Figure 3 Spatial Distribution of Public water. **Source: Authors Fieldwork (2017)**

Distribution of Tarred Road in Bida

Similarly, tarred roads in Bida were digitized from high resolution image of Bida acquired from IKONOS. The length of the roads was calculated using ARCGIS and recorded across the fourteen (14) wards. Table 4 shows the length of the tarred road in Bida. The analysis reveals that the total length of tarred roads in Bida is 53.8 hectares. Bariki ward enjoy 27.9% of the tarred roads, followed by Kyari (14.9%). Tarred road in Cheniyan account for 9.3%, Dokoza (9.0%), Umaru Majigi B (8.8%), and Umaru Majigi A (8.4%). All other wards have less than 8% of the total tarred roads in Bida respectively.

Table 4: Length of Tarred Road in Bida

Ward	Length (Ha)	Percentage
Bariki	15.0	28
Cheneyen	5.0	9
Dokoza	4.8	9
Kyari	8.0	15
Landzu	0.7	1
Masaba A	1.0	2
Masaba B	1.2	2
Masaga A	0.5	1
Masaga B	0.3	1
Mayaki Ndajiya	2.2	4
Nasarafu	2.4	5
Umaru Majigi A	4.5	8
Umaru Majigi B	4.7	9
Wadata	3.4	6
Total	**53.8**	**100**

Source: Authors Analysis (2017)

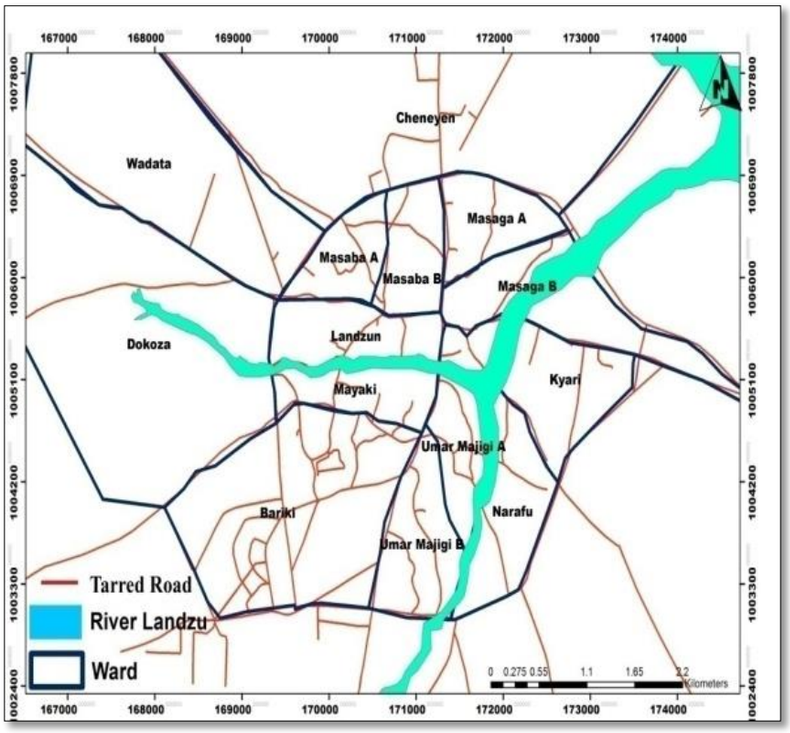


Figure 4 Distribution of tarred road
Source: Authors Analysis (2017)

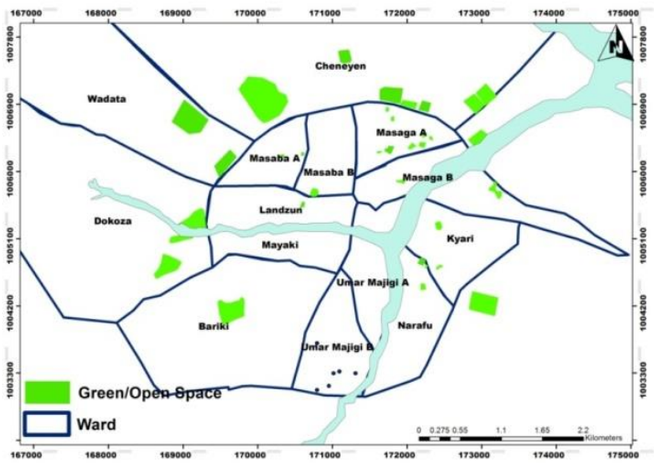
Distribution of Green Area in Bida

Green areas/open spaces in Bida were identified from the high resolution image. The area coverage of the green areas was calculated using GIS on ARCGIS 10.2 and recorded accordingly for all the wards. Total area of green areas identified in Bida is 93.3 hectares as depicted in Table 6. The largest proportion (39%) of the green areas is located in Cheneyen, 20% in Dokoza, 12% in Kyari, while Bariki and Masaba B had 11% of the green areas respectively. The five aforementioned wards share 93% of the total green areas/open space, while the balance of 7% is shared by Masaba A, Masaga B, Landzu, Nasarafu, and Umaru Majigi B in the following proportion 3%, 1%, 1%, 1%, and 1% respectively.

Table 5: Distribution of Green Areas and Open Space

Ward	Area(Ha)	Percentage
Bariki	10.5	11
Cheneyen	36.3	39
Dokoza	18.6	20
Kyari	11.0	12
Landzu	0.4	1
Masaba A	2.5	3
Masaba B	10.5	11
Masaga A	0.1	0
Masaga B	1.0	1
Mayaki Ndajiya	0.2	0
Nasarafu	0.9	1
Umaru Majigi A	0.5	0
Umaru Majigi B	0.5	1
Wadata	0.3	0
Total	**93.2**	**100**

Source: Authors Survey (2017)



Source: Authors Survey (2017)

Spatial Inequality Index of Environmental Amenities in Bida

The spatial inequality index of environmental amenities in Bida is presented in Table 7. The result shows that the composite index (GC) is 0.46, which implies moderate inequality in the distribution of environmental amenities. Public schools ranked 1st with an inequality index of 0.59, followed by primary health centres (0.57), and green areas (0.54). Public water amenities and tarred road record a GC of 0.31 respectively, which implies a moderate inequality in the provision of the amenities. The implication is that, more attention need to be paid to the provision and distribution of public schools, primary health centres and green areas in Bida. The distribution of public water amenities (borehole) and tarred roads in Bida is fairly equitable.

Table 6: Composite Inequality Index of Environmental Amenities

Environmental Amenities	Index	Rank	Remark
Public Schools	0.59	1	High
Primary Health Centres	0.57	2	High
Public Water Amenities	0.31	4	Moderate
Green Areas/Open Space	0.54	3	High
Tarred Roads	0.31	4	Moderate
Composite	0.46		Moderate

Source: Author Survey (2017)

CONCLUSION

Understanding that provision of environmental amenities is basic to economic development and wellbeing of the people, this study made an effort to bring into focus the types, number, and variation in environmental amenities in Bida LGA, of Niger State. These environmental amenities include schools, green areas, road, health centres and water amenities. It is evident that the environmental amenities are unevenly distributed over space. While some localities are having more than their average share of the environmental amenities over and above other areas, there exist many areas that are lagging behind. The environmental amenities are found to be localized in some wards at the expense of other wards in Bida.

This lopsidedness pattern of environmental amenities provision should be given more attention by adopting an objective investment in environmental amenities in favour of the disadvantaged areas and this will help not only to promote the spirit of distributive justice but also it will go a long way to foster regional balance in our developmental efforts in Bida. Therefore, all hands must be on deck towards ensuring adequate provision and proper distribution and citing of environmental amenities in Bida.

RECOMMENDATION

The study recommendation is as follows;

The government should ensure that the provision of environmental amenities in Bida is marched with the population of the wards to ensure equity in the distribution of the environmental amenities in Bida. It is not enough to have a fair share of the environmental amenities clustered within a ward a particular area in the wards, emphasis must also be paid to the walking distance to the amenities within the wards. The environmental amenities must be located within walking distance across Bida to avoid internal inequality.

Since it has been established that the number of schools available in Bida is adequate for the population, yet it records the highest inequality index. Therefore, attention must be paid to the

distribution of the schools to ensure that each ward enjoy a fair share of the schools as required by the population.

Government at all level should also pay attention to the spatial distribution pattern in the planning, provision and distribution of environmental amenities in Bida. Furthermore, considering the positive effects of environmental amenities on the lives of the people, and to avoid lopsided urban drift, there is the need for the provision of more primary health centres, and green areas. Governments at all levels should partner with other private organizations to undertake the provision of environmental amenities in order to meet the needs and aspirations of the people.

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USER SATISFACTION WITH ORGANIC ARCHITECTURE DESIGN CONSIDERATIONS IN HOSPITAL, ABUJA

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Research indicates that the patient's outcome is linked with a hospital's physical environment. With the aftermath of climate change on the world's eco-system which ignited the adoption of sustainable design approaches in the development of the built environment i.e. nature inspired design concept. This environment includes the hospitals which functions primarily as a place for recovery and restoration of health and wellbeing of patients through its facilities. In order to enhance effective performance, in the face of challenging climatic conditions as well as providing adequate response to the health needs of the users, natural elements as seen in organic architecture comes into consideration. Hospitals are places for healing, and research has shown that the natural environment also aid the quick recovery of patients. In the same vein, organic architecture advocates for limited changes to the natural environment. The problem therefore is that the hospital environment has not optimize the design considerations of organic architecture necessary for the effective functioning of the hospital environment on it users. Consequently, this paper seeks to study the satisfaction of users on the available design consideration of organic architecture in hospitals, Abuja. The research adopted the use of structured questionnaire and interviews. Six public hospitals were selected for the study within Abuja Municipal Area Council (AMAC). The data obtained was analyzed with the aid of statistical package for social scientists (SPSS) with triangulation of the results transferred to Micro-soft Excel. The results shows that users are dissatisfied with the impact of the available organic architecture design considerations. In order to maximize the benefit of organic architecture, in hospitals it is recommended that the management of hospitals focus more on nature, toward achieving a therapeutic environment. Which will then lead to an improvement in patient outcome. These design concepts can also be utilized in the design of other public health buildings.

Keywords: *eco-system, sustainable design, hospitals, organic architecture, design considerations*

INTRODUCTION

Healthcare research has looked most recently into the connection between the physical environment and their importance on health outcomes of patients. These connections are also being expressed in the outcome of researches done in the field of organic architecture. In the same vein, modern hospitals have had to contend with complex technological issues due to complex medical procedures (Monti *et al*., 2012; Mourshed & Zhao, 2012; Ulrich, 2002). Majority of healthcare design emphases on the functionality and treatment of diseases (Dijkstra, *et al*.,2006). Hence, preferences have been given on the mode of architectural design of healthcare facilities to reflect psychological fit between people and their physical surrounding (Bringslimark, *et al*., 2009; Holfelder & Schott, 2014). Based on this fact, the environment can influence on mood, stress level, and wellbeing of patient and their families. Recently the design of health care environments has shifted from the geometric style of providing space towards incorporating users perceptions and performance in a context (Kosmadoudi *et al*., 2013) to further emphasize the need for users satisfaction in design processes. Such needs have been pointed out in past studies on post occupancy evaluation done on hospice spaces by (Sherman, *et al*., 2005) revealing hospital environments as a neglected healing space.

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Other aspects that are considered to influence the patient's outcome are nature view from windows, presences of green open spaces, colour, sounds, natural lighting and ventilation. (Abbas & Ghazali, 2012; Dijkstra *et al*., 2006). The human crave for natural settings reveals how nature offers an environment for healing from the effect of acquired stress (Joye & van den Berg, 2011, Dunleavy *et al*.,2014). Current research findings which support stress and pain reduction during hospitalization through the presence of nature explain the importance's of organic architecture. Examples are active and passive distracts on pain reduction seen in researches done by (Carlson, *et al*., 2000; Koller & Goldman, 2012; Kuo & Faber Taylor, 2004; Pluhar, *et al*., 2010; Srouji, *et al*.,2010; Svendsen & Bjørk n.d..). Design of hospital in Nigeria is seen in the light of other public buildings given no cognizance to nature. This paper therefore seeks to evaluate the level of satisfaction of patient on the selected organic architecture considerations in hospital wards, with a view to recommending how these consideration can be well integrated based on literature reviews to improve patient outcome in hospitals.

User Perception and Satisfaction in Hospitals

Research suggests a strong association between health outcomes and the physical environment in which a person lives or receives treatment (Gesler et al., 2004; Rollins, 2004; Ulrich et al., 2008). Consequently, attention has recently been turned on the actual architectural design of a healthcare facility (Reiling, 2007). The idea of 'place making' or the provision of an optimum psychological fit between people and their physical surroundings has received renewed interests among the design community (Sime, 1986), in particular from healthcare designers (Prasad, 2008). Place making can be seen as a move away from the mere geometric design of spaces towards a more holistic consideration of user perception and behaviour in the physical context. Examples of place making by integrating research-based evidence in hospital design can be found in the idea of 'sense sensitive design' (Mazuch, 2005). The need for integrating user perception and preference of their physical surroundings in buildings has also been highlighted, directly or indirectly, in past research on post occupancy evaluations of buildings (Dinç, 2009), user satisfaction (Crow *et al*., 2002) and indoor thermal comfort (De Dear, 2004)..

Overview of Organic Architecture Design Considerations in Hospitals

Organic architecture is an architecture that draws inspiration from nature, this idea of architecture was seen in the works of Frank Lloyd Wright who in the course of his practices emphasize the need to integration nature into built environment. More so, recently researches on evidence based recovery in health care have explained in great details the importance of nature in the recovery of patients. Hence placing nature in proximity with man has been proven to inspire recovery and reduce length of stay in the hospital. The basic elements of nature includes, the landscapes, the sun , the wind, and each has a role it play in the delivery of the impact of nature on man therefore, for the purpose of this research work the organic architectural design considerations will include: landscape elements, natural ventilation and natural lighting as an extract from the basic elements of nature.

Stress Reducing Effects of Viewing Plants and Nature

A study of non-patient groups (such as university students) as well as patients have consistently shown that simply looking at environments dominated by greenery, flowers, or water - as compared to build scenes lacking nature (rooms, buildings, towns) - is significantly more effective in promoting recovery or restoration from stress (Ulrich, 1999). A limited amount of research suggests that viewing settings with plants or other nature for few minutes can promote measurable restoration even in hospital patients who are acutely stressed. There is considerable evidence that restorative effects of natural scenes are manifested within only three to five minutes as a combination of psychological/emotional and physiological changes. Concerning the first, psychological/emotional, many views of vegetation or garden-like features elevate levels of positive feelings (pleasantness, calm), and reduce negatively toned emotions such as fear, anger, and sadness. Certain natural scenes effectively sustain interest and attention, and accordingly can serve as pleasant distractions that may diminish stressful thoughts. Regarding physiological manifestations of stress recovery, laboratory and clinical investigations have found that viewing nature settings can produce significant restoration within less than five minutes as indicated by positive changes, for instance, in blood pressure, heart activity, muscle tension, and brain electrical activity (Ulrich, 1981; Ulrich *et al*., 1991).

RESEARCH METHOD

A post occupancy evaluation method was used in conducting this research as it helps the researcher understand the users' view of the subject matter that is being investigated. In the words of Adedeji & Fadamiro (2012) Post Occupancy Evaluation (POE) is a generally accepted method of getting the opinion of users pertaining the built environment especially when it is in relation with studies that shows perception (Adedayo *et al.,(*2014). Zimmerman and Martin (2001) opined that POE tests are generic and specific aspects of the planning and detailed design of facility buildings. "It also tests their impact on building users with respect to several parameters such as: health and safety, security, indoor environment quality and functions." Adedayo *et al.,* (2014). The concept of post occupancy evaluation in this study is geared toward understanding how users perceive the space in which they exist; in this case this space is the hospital wards. Based on the literature reviewed, hospital wards in order for it to maximize it potentials as regards patient outcome has to be therapeutic. The use of post occupancy evaluation is to ascertain how therapeutic these spaces are by assessing the design consideration of organic architecture in these in space.

Abuja the federal capital territory was chosen because it milestone in development in the middle belt region of Nigeria. It has several local government council, of which is Abuja Municipal Area Council (AMAC) is one. AMAC has the largest population of residents in the F.C.T in it various districts hence it's selection for this research. A questionnaire was developed and administered to respondents selected from the six major district hospitals in AMAC which formed the population of study as shown in table 1.0 below. A total of 120 copies of questionnaires were distributed in ratio based on the land mass and the capacity of the facilities in each hospital. 86 copies were returned. These questionnaires were administered on the patient's population. The sampling method use was purposive sampling method to select patients from these hospitals, According to Zikmund (2003,) purposive sampling is "a non-probability sampling technique in which a researcher selects the sample based on his/her judgment about some appropriate characteristics required of the sample members". while interviews were conducted with the staff which includes doctors and nurses. The data collected was sorted based on hospitals using SPSS for analysis purpose while results were presented in tables and charts. . The calculation of the rating of selected satisfaction questions was based on the Likert scale upon which the recommendations of the research would be based.

Likert Scale Measurement of Perception on Organic Architecture Design Consideration

The Likert scale of measurement is tailored in a weighted scoring sequence of 1-4 was apportioned to the different options for choice for the respondents based of their perception of the variable being measured. The scoring of the options is stated below;

Very Dissatisfied (1) Dissatisfied (2) Satisfied (3) Very Satisfied (4).

These variables include, size of wards , location of wards, privacy in the wards, views to nature, natural ventilation, therapeutic landscape and natural ventilation in wards. The variable were been administered though questionnaires and a check was done with coded interview results.

Table 1.0: District Hospitals Studied

Name of Hospitals	Sample Size
National Hospital	34 persons
Asokoro District Hospital	29 persons
Maitama District Hospital	23 patients
Wuse District Hospital	17 patients
Garki District Hospital	11 patients
Gwarinpa District Hospital	6 patients
TOTAL	120 patients

RESULTS AND DISCUSSION

Demography of patients

The table 2.0 below explains the distribution of patients in age, inpatient types and accommodation types. It is on this basis that the satisfaction of users will be carried out.

Table 2.0: Demography of Patients

Demographics	Scale	Male	Female	Total
Ages				
	18-25	4	8	12
	26-35	5	9	16
	36-50	16	23	39
	>50	8	11	19
Inpatient type				
	Short term stay	19	35	54
	Long term stay	12	20	32
Accommodation type				
	Single-bed room	5	11	16
	Multi-bed 2-4	8	14	22
	Multi-bed 4-ABOVE	12	36	48

Table 3.0 below shows that majority of the respondents are spread within the satisfied and dissatisfied section of the scale of measurement. The number of respondents in each section is multiplied by the weighted score allocated to it, the calculation for this is shown in table 4.0 and the total score across the rows are added up and presented as the total at the end of the table.

Table 3.0: Number of patient respondents per opinion on Satisfaction with Organic architecture design considerations Measured

Measured Variable	Very Dissatisfied (X1)	Dissatisfied (X2)	Satisfied (X3)	Very Satisfied (X4)	Total
Rating of size of the wards	55	22	6	3	86
Rating of location of wards	20	36	17	10	83
Rating of privacy in wards	40	35	2	8	85
Rating of views to nature	25	37	12	10	84
Rating of adequacy of natural ventilation in wards	36	20	16	14	86
Rating of therapeutic landscape	45	20	13	8	85
Rating of adequacy of natural lighting in wards	32	18	30	6	86

Table 4.0: Sum of patient respondents per opinion on Satisfaction with Organic architecture design considerations Measured

Measured Variable	Very Dissatisfied (X1)	Dissatisfied (X2)	Satisfied (X3)	Very Satisfied (X4)	Total
Rating of size of the wards	55	44	18	12	129
Rating of location of wards	20	72	51	40	183
Rating of privacy in wards	40	70	6	32	152
Rating of views to nature	25	74	36	40	175
Rating of adequacy of natural ventilation in wards	36	40	48	42	139
Rating of therapeutic landscapes	45	40	39	24	148
Rating of adequacy of natural lighting in wards	32	36	90	18	176

Table 5.0 below shows the interpretation of the results obtained based on the Likert scale calculation is based on the range of scale stated as follows:

1.0	-	1.49	Very Dissatisfied
1.5	-	2.49	Dissatisfied
2.5	-	3.49	Satisfied
	>	3.5	Very Satisfied

Table 5.0: Respondents Opinion on Satisfaction with Organic Architecture Design Considerations Measured

Measured Variable	Sum	Mean	Interpretation
Rating of size of the wards	129	1.50	Dissatisfied
Rating of location of wards	183	2.20	Dissatisfied
Rating of privacy in wards	152	1.79	Dissatisfied
Rating of views to nature	175	2.10	Dissatisfied
Rating of adequacy of natural ventilation in wards	139	1.62	Dissatisfied
Rating of therapeutic landscapes	148	1.74	Dissatisfied
Rating of adequacy of natural lighting in wards	176	2.05	Dissatisfied

Observations from table 5.0 above shows that all the responses obtained turn out as dissatisfied. These shows that the respondents are not happy with the stated and condition of the ward spaces provided in the hospitals visited. All categories of organic architecture in the wards measured were not to the satisfaction of the respondents. These views can be understood based on the observations conducted on the hospital wards during the research as less attention is been placed on the welfare of the patients. The opinion of the care givers also confirmed the validity of these views. The problem was seen to be poor funding from the government and less attention been paid to the integration of organic architecture design consideration in hospitals Abuja.

Organic Architecture in Wards Rating Based On Adequacy of Natural Ventilation

Natural ventilation is a necessity in living spaces in order to achieve maximum comfort. The indoor air quality of a space in determined by how well ventilated the space is. These can be achieved through natural and artificial means. Organic architecture there provides a natural means of ventilating our wards through some of it design considerations such as size openings, location of lobbies, indoor plants, orientation of the building and space. The chart below shows that 42% of the patients in the selected hospitals are very dissatisfied with the natural ventilation system in the hospitals these is because the window types were observed to be more of sliding window. This type of window is considered not effective for natural ventilation purposes in any building.

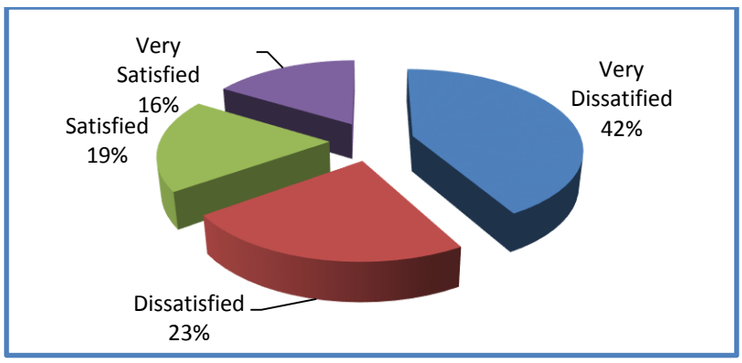

Figure 1.0: Satisfaction with Organic Architecture in Wards Based On Adequacy of Natural Ventilation.

Organic Architecture in Wards Rating Based On Adequacy of Natural Lighting

Photo therapy is a major importance of natural lighting in hospital. Recent studies have shown a relationship between natural lighting and length of stay in the hospital. The presence of early morning sun provides vitamins D to the patient. The beauty of the natural environment is well appreciated when the illumination of natural lighting is adequate. In figure 1.1 below, majority of the respondents are very dissatisfied with the natural lighting condition shown at 37% although 35% of the same sample size expressed their satisfaction on the natural lighting of the hospital. The reason for these was discovered to be over exposures of some wards to nature leading to discomfort in the indoor environment.

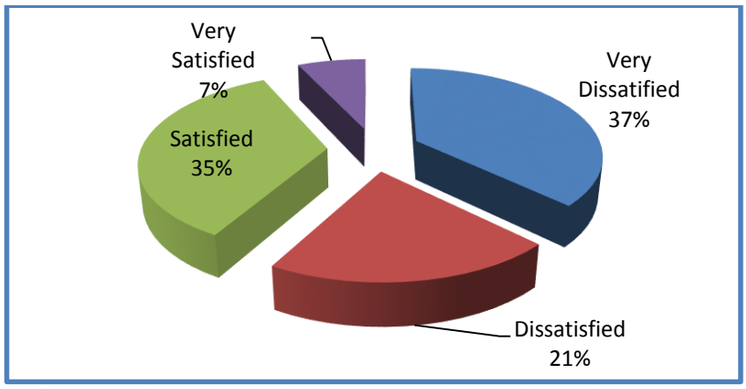

Figure 1.1: Satisfaction with Organic Architecture in Wards Based On Adequacy of Natural Lighting.

Organic Architecture in Wards Rating Based On Therapeutic Landscapes

Landscaping has formed a major tool for nature to be visible in an environment it is therefore important to check the user's perception on the therapeutic effect of these landscapes. The result as seen in fig 1.2 below showed that 47% of the patients are very dissatisfied with the types of landscape available and derives no therapeutic benefit from them. Hence observation shows that landscapes were geared to cooling and aesthetics.

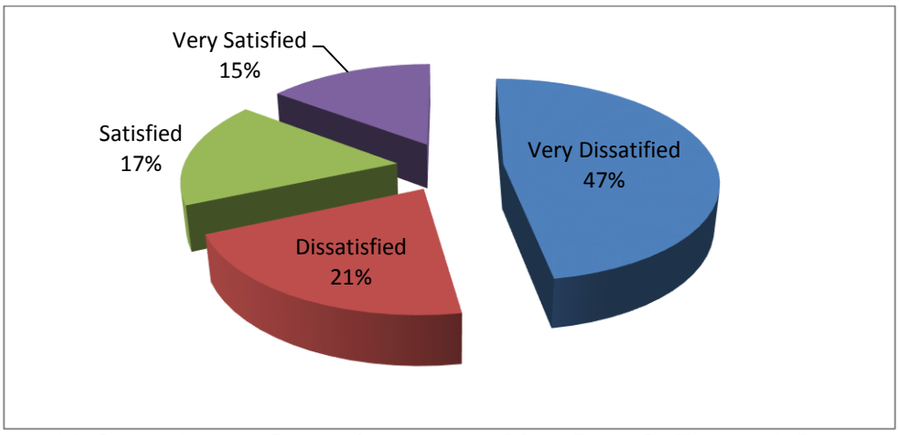

Figure 1.2: Satisfaction with Organic Architecture in Wards Based On Therapeutic Landscapes.

Organic Architecture in Wards Rating Based On Views to Nature

A view to nature according to recent researches has been shown to provide assisted healing to patients and to reduce the length of stay in the hospital. Patient who stayed in room with

maximum natural views to trees, water formations and other natural element recover much quicker. In the hospital selected the perception of these patients is not in support of this fact as many of them at 44% were dissatisfied with views they had to nature, as shown in figure 1.3 below . The problem basically occur more in accommodation type with multi-bed 4 and above as seen in table 2.0, as it is impossible to provide such to every patient in these large ward spaces.

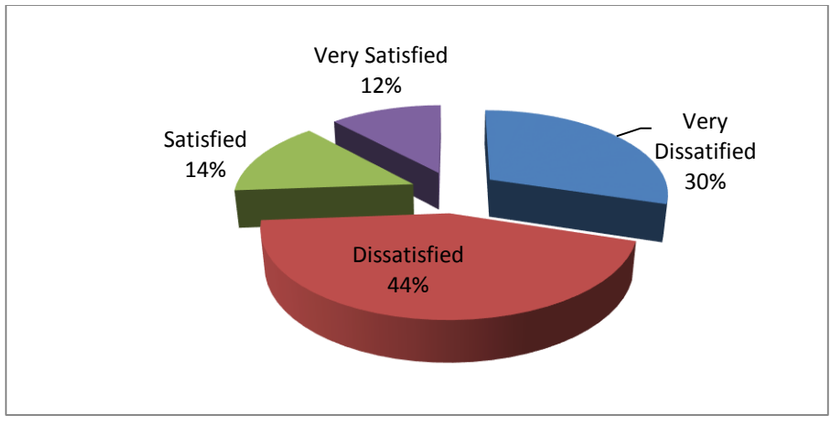

Figure 1.3: Satisfaction with Organic Architecture in Wards Based On Views to Nature.

CONCLUSION

Hospital wards are of great importance to the recovery process in hospitals. Recent researches has linked recovery rate the environment in which it is taken place. It therefore of great importance to give priority to our hospital wards, in making them therapeutic through the in introduction of organic architecture design considerations. During the course of the research majority opinion on the state and condition of the wards turned out dissatisfied, this is due to the low level of attention paid toward organic architecture design consideration, as regards the space configuration of the wards, natural ventilation, lighting and landscape. It is therefore important that government through the management of these hospitals provide space with adequate integration of natural element, to meet the aspiration of the users. Also the design of new hospital should take into cognizance's the location of wards in regards to the sun path and the view seen from the wards to maximize the effect of nature. it was also discovered that patients in wards with few beds recover fast than those in larges wards this as a result of so many distractions from the activities of other patients. In conclusion the nature of space a patient is accommodated has an effect on their recovery process and their length of stay in the hospital.

RECOMMENDATION

It is therefore recommended that patients be allowed to make inputs on the sizes of their wards, location of their wards, the level pf privacy desired in the ward and experience of nature they will love to have during their stay in the wards should also be considered. It's also important to provide landscape elements in ward to harness the therapeutic potentials of the existing wards with window types such as awning windows that allow for maximum lighting and ventilation. Landscape element such as indoor plants, scrubs, trees, lawns and hedges, water bodies, rocks and relief forms should be incorporated in the design of hospitals.

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URBAN LAND ACCESS

EFFECTIVENESS OF COMPULSORY LAND ACQUISITION PROCESS IN DURUMI DISTRICT, ABUJA NIGERIA

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In spite of the statutes guiding Compulsory Land Acquisition and Compensation (CLA&C) procedure in Nigeria, the outcomes of such process are nonetheless filled with numerous problems ranging from difficulty in identifying claimants, unjust compensation to lingering disputes between the acquiring authorities and the affected communities. This study therefore attempts an assessment of the effectiveness of compulsory land acquisition and compensation process in Durumii, Abuja. Data for the study were sourced from the local settlers at Durumi in Abuja and officials of the Federal Capital Development Authority directly involved in the CLA&C exercise. The data retrieved from these respondents were as varied as claimants' satisfaction with compensation assessment, public participation and transparency, processes involved and challenges encountered during the exercise. Cronbach's reliability test and factor analysis were employed in the data analysis. Findings indicate that 94% and 92% of the respondents opined that reconnaissance survey and publicity of the CLA&C exercise were very high. While 87% and 94% agreed that the compensation payment and change of ownership was highly characterised as being ineffective. The outcome of the factor analysis further highlight the importance of three (3) factors; institutional challenges, claimants attitude and sentimental value attached to land) which account for 75.099% of the total variance of the challenges affecting CLA&C. These by extension are severe impediments to the effective process of CLA&C in the study location. The study recommends a policy response from the relevant authorities (Federal Government and the acquiring authorities) in terms of evolving a sustainable model for CLA&C exercise where the stakeholders are actively involved.

Keywords: Challenges, Compulsory Acquisition, Compensation, Effectiveness, Process,

INTRODUCTION

In most countries of the world and especially the third world ones, urban areas are the hub of economic, social and political activities. They are mostly the seat of administration and typically accords residents access to some level of quality of livelihood that otherwise they could not access within other non-urban areas. This presents greater opportunities and economic way out that attracts continual rural-urban migration and immensely increases the urban population. As a consequence, the requirement for expansion leading to the provision of public goods and services (infrastructure) and other projects of both economic and social value to the general public becomes pertinent. In view of this, more space will be required to meet the emerging demands of which the constitutional responsibility of the government under this circumstance comes to bare. Government has to acquire suitable land at suitable locations for particular purposes in order to sustain the growing urban demand.

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Compulsory acquisition is the power arrogated to the government to acquire private property interests in land irrespective of whether the owners or occupants consent to it or not in order to benefit the entire society (Food & Agricultural Organisation, 2008). Relatedly, Umeh (1973) described it as a coercive taking of private lands or estates and interests in the lands for public purposes. The entire process is that which the dispossessed people are forced to sell their properties for public purpose (Ndjovu, 2016). According to Evans (2004), the powers of compulsory purchase are unusual in that they are generally regarded as acceptable in a democratic society. Although this may be so especially in those societies where government deemed it necessary to established as matter of policy implementation that, social benefits of its use outweighs the social costs. In England and Wales, Plimmer (2007) revealed that the use of the powers is unpopular. While the legal acceptability of the powers remained wide, the social acceptability remains contentious and no matter what good intentions the public purpose might be, land owners are always apprehensive, reluctant and often unwilling to give up their rights and interests despite being compensated (Martin, 2010; Ndjovu, 2016). In Nigeria, distrusts and uncertainty arising from government antecedents often results in conflict whenever there is compulsory purchase (Kakulu, 2007; Thomas, Ashaolu, Onifade & Adewusi, 2010).

The Land Use Act has remained the main policy instrument that prescribes the procedures for the execution of compulsory purchase and compensation as well as provides a framework for the resolution/settlement of disputes arising from the exercise. (see section 28, 29, 31-33). It is also backed by the Constitution of the Federal Republic of Nigeria, 1999 under section 43 and 44. The procedures for compulsory acquisition are as follows; selection and inspection of a suitable land (Reconnaissance Survey), service of notice of government intention to acquire, assets (property) enumeration and assessment for compensation (valuation process), payment of compensation, submission of complaints and petitions, setting up of panel for dispute resolution. The transparency in the execution of these processes is required in order to ensure credibility of the exercise. However, the defective manner the entire land acquisition process is undertaken in some cases tends to undermine the objective it seeks to achieve. Abuja, the Federal Capital Territory is growing and expanding rapidly and as such, has witness several land acquisition exercises, while some have been executed, others are at stalemate. Irrespective of the availability of statutes guiding the land acquisition process, outcomes are usually marred by a plethora of challenges ranging from the issuance of notices, enumeration and valuation for compensation to inadequate and delay payment of compensation (Kakulu, 2007; Otubu, 2012; Iroaganachi & Gambo, 2012; Udoekanem, 2013; Sule, 2014; Deeyah & Akujuru, 2016).

It is in view of the foregoing that this study aim at assessing the effectiveness of the process of compulsory land acquisition and compensation exercise in Durumi District (Phase 1 and 2), Abuja. The study objectives are; to examine the land acquisition procedures, the satisfaction level of the affected community as well as identify the challenges constraining effective land acquisition exercise in the case study. The justification for the study is stemmed from the fact that, several studies have been conducted relating to issues of compulsory land acquisition and compensation but mostly focused on assessing inadequacy of compensation arising from inappropriate valuation approach, low assessment rate for crops and economic trees. Very few dwell on examining the effectiveness of the processes involved in the compulsory land acquisition exercise especially in Nigeria. This aspect as often over looked, is very significant to building the confidence and satisfaction level of the dispossessed communities or persons as it will also ensure credibility of the exercise.

LITERATURE REVIEW

Land is an invaluable asset or resource to the lives of many people and their future generations (Kombe, 2010). Land is not only valuable to the lives of individuals or communities but also a measure of any country or nation's capacity for economic and social development. From this understanding, the use of the power of eminent domain or compulsory purchase of rights and interests of persons or communities is often perceived as a denial of their fundamental means of survival and livelihood. Although the use of the power is inevitable due to continued urban morphology, this perception typically exerts a level of impact on the outcome and most experience with the exercise in Nigeria indicates dissatisfaction and disputes. These are mostly heightened by the poor nature the procedures are handled which include poor assessment and inadequate payment of compensation that has become characteristic of the exercise.

The principles of compensation is based on the principles of indemnity which supposes that the parties that suffer loses through the exercise of the compulsory purchase should be reinstated to their former position before the acquisition. It can be carried out by compensating them appropriately for the loss suffered so as not to leave them worst off after compensation (Olayonwa, 2006). However, in cases where the affected persons are not indemnified or inadequately compensated, it creates friction between the acquiring authorities and the affected persons. Kakulu (2007) asserted that the payment of inadequate compensation to the affected land owners is seemingly a major contribution to the crisis in the Niger Delta region. This assertion could be valid considering that this is a region where compensations are not just required for expropriation but loses as a result of damage caused by oil and gas exploration activities.

Quite a substantial number of studies have revealed the persistent issue of lack of payment or inadequate compensation in compulsory acquisition exercises. Kakulu (2007) assessed the compensation issue in the compulsory acquisition in Niger Delta and the study reviewed the processes of valuation for compensation. Findings revealed the existence of distinct methods, standards and procedures of valuation that produces inconsistent outcomes in the amount of compensation payable that was inadequate. The study further attributed complexities, lack of transparency and inconsistencies in the interpretation of the various sections of the Land Use Act as some of the causal factors. Thus, recommends the adoption of a code for compensation valuation practice in Nigeria.

Udoekanem (2013) presents a similar case of inadequacy in the amount of compensation payable arising from the valuation methods prescribed by the Land Use Act of 1978. The study essentially compares outcomes of compensation values determined using appropriate market based methods and those determined by the techniques or methods provided by statute. Using data obtained on environmental assets damaged as a result of gas flaring in the Niger Delta region. The outcome indicates that affected persons will only be adequately compensated if market based procedures of compensation valuation were adopted. Sule (2014) presented a similar argument that the current provision of the Act on valuation method adopted to determine compensable value cannot guarantee adequate compensation in any land acquisition exercise in Nigeria.

Section 29 of the Act provides for compensation upon expropriation of interests and also specifies circumstances where compensation is not required. Kakulu (2008) observed that this section is grossly inadequate for the purpose of fair, just and adequate compensation. Although the provision of the Act on valuation methods may be inadequate as indicated it is only suitable for non-commercialised interests (Sule, 2014). Those that do not have market value due to their specialised nature, examples are churches, mosques, shrines etc. In Kenya, Safuna (2003) reported that the statutes on compulsory land acquisition are grossly inadequate in terms of compensation of affected persons or communities whose properties are expropriated or affected by government actions. The issue of inappropriate methods of assessment and valuation have provided for little consideration of the land owners' interests. China also has an ambiguous land laws relating to compulsory acquisition and compensation. They do not provide for compensation for the expropriation of rural land. Chan (2003) indicated that besides rural land, the laws do not also provide for adequate, fair and just compensation under any circumstance and the laws are often regarded as undemocratic.

An investigation into the existing practices of compulsory purchase and valuation for compensation in Nigeria to ascertain its adherence to international best practices was conducted by Deeyah and Akujuru (2016). Existing evidence from the compulsory acquisition in road construction in Rivers State and other evidence from earlier reported case studies were used. They found issues such as poor service of public notice, inadequate time given for relocation and lack of transparency in the compensation exercise that are inappropriate and amounting to non-adherence to international best practices.

The provisions of appropriate laws and the question of adequate compensation have received a phenomenal attention and yet remained unresolved. Research conducted in several countries across regions of the world have shown similar outcomes relating to the inadequacy of the legal and institutional framework to properly deal with issues of appropriate assessment and valuation methods and procedures. Viitanen and Kakulu (2009) carried out a review of related literature on compulsory acquisition and compensation highlighting areas of global concern. Their key submissions for a way forward were;

improvement in technical expertise, transparency and fairness as well as the need for a uniform global best practices especially in the assessment and compensation procedures.

RESEARCH METHODOLOGY

Durumi District is one of the 5 districts under the phase 2 of Abuja, the Federal Capital Territory. The district is divided into 3 development phases with Phase 1 abutting Garki district, Phase 2 abutting Gudu district and Phase 3 bordering Kaura district respectively.

In 2005, the Federal Capital Development Authority (FCDA) revisited the issue of compulsory land acquisition in the district which was initiated but abandoned. After the enumeration of assets of the affected persons, it was determined that they will be resettled in another development area but the offer was rejected by the community and they headed to court to challenge the procedures and compensation payable. This has affected the FCDA from taking effective control of the Phase 1 and 2 to date. See map of Durumi District in Figure 1 below.

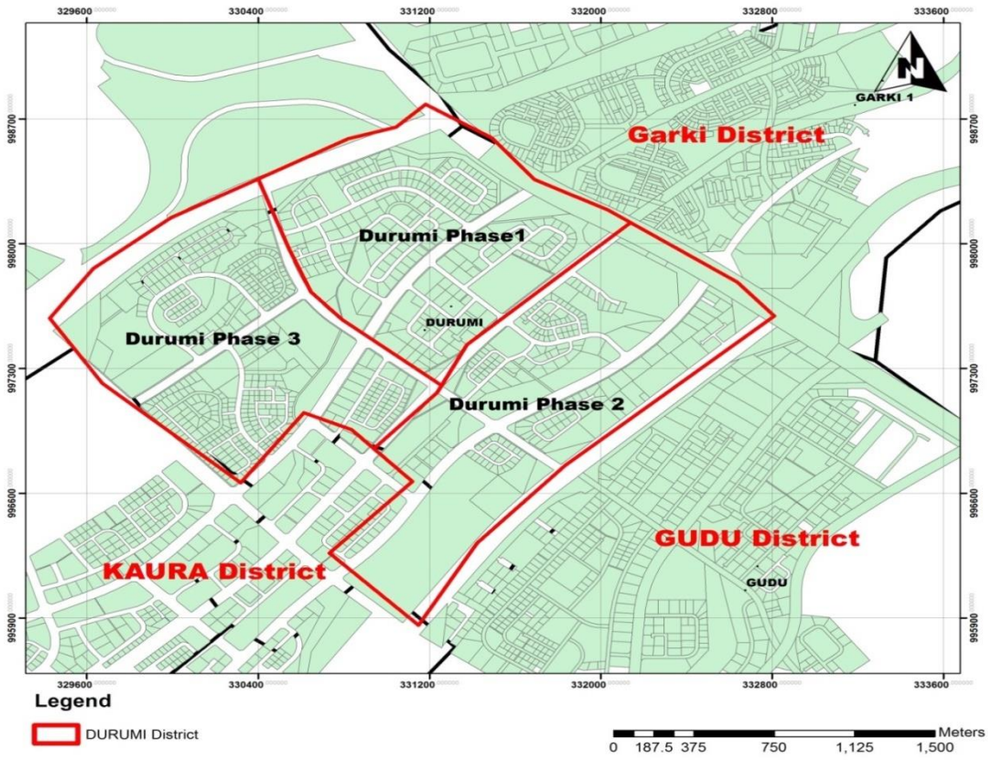

Figure 1: Durumi District and its development Phases

A preliminary survey method was carried out with a reconnaissance visit to the study area to ascertain the extent of the population in terms of numbers and their literacy level. This was meant to enhance an understanding of the structure and demographics of the residents that will in turn inform the determination of appropriate techniques for sampling and data collection strategy. The sample adopted for the study was a convenience of 400 respondents and questionnaire were administered with the help of field assistants. Interviews were occasionally used to confirm the general pattern of information being provided in the questionnaire by the respondents. Also a confirmatory interview was conducted on 2 of the officials of the FCDA who participated in the exercise to ascertain some of the claims and allegations made by the affected residents of Durumi.

The use of a quantitative methodology in this research was made hence a 3-point likert scale was designed to measure the effectiveness of the process of the compulsory acquisition exercise and satisfaction levels of the respondents. While a 4-point scale was used to measure the challenges. Data collected were analysed with the use of descriptive statistics, the development of satisfaction indexes and factor analysis techniques.

RESULTS AND DISCUSSION

The residents of Durumi have predominantly male household heads made up of 93.75% and female 6.25%. Majority of them are married (94.75%) and basically farmers while 8% are under government employment (civil servants).

Table 1: Demographic characteristics of the Respondents

Items	Description	Freq	%
Gender	Female	25	6.25
	Male	375	93.75
	Total	400	100
Marital Status	Married	379	94.75
	Single	10	2.50
	Divorced	3	0.75
	Widowed	8	2.0
	Total	400	100
Primary Occupation	Civil Service	32	8.0
	Trade/Business	74	18.50
	Farming	279	69.75
	Retired from Service	15	3.75
	Total	400	100

Source: *Authors' fieldwork, 2016*

A measure of the effectiveness of the processes of land acquisition exercise was carried out and presented in table 2 below. For ease of interpretation of results, a hypothesized mean or benchmark was computed as 3 + 2 + 1 = 6 (6 ÷ 3 = 2.00) and used to determine the significant level of the effectiveness of the process (Ikediashi, Ogunlana & Boateng, 2014).

Table 2: Effectiveness of the land acquisition exercise in Durumi

Process	3	2	1	W*fx*	Mean
Reconnaissance Survey	0.195	1.870	0.000	826	2.065
Service of notice	0.233	1.845	0.000	831	2.078
Enumeration & assessment for compensation	0.030	0.480	1.183	677	1.693
Submission of Claims	0.090	0.870	0.535	598	1.495
Payment of Compensation	0.000	0.260	0.870	452	1.130
Treatment of petitions	0.000	0.120	1.383	601	1.503
Procedures for change of ownership	0.000	0.255	1.310	626	1.565
Time given for relocation	0.245	0.755	1.130	852	2.130

Source: *Authors' fieldwork, 2016*

The result has shown that the conduct of the reconnaissance survey, service of notice and time given for relocation has mean values of 2.065, 2.078 and 2.130 which are higher than the hypothesized mean (Benchmark of 2.000). This indicates that the 3 procedures were considered effective. However, enumeration of assets, submission of claims, payment of compensation, treatment of petition and procedure for change of ownership were considered ineffective. The mean values computed under these items are below the hypothesized mean hence their effectiveness is statistically insignificant.

Claimants' satisfaction with compulsory land acquisition process in Durumi

The satisfaction level of the claimants with the outcome of the land acquisition exercise was measured and individual items and overall satisfaction indexes were also determined. The result has shown that claimants' overall satisfaction index is 0.452 indicating that they have expressed very low satisfaction level of 45.2% with the land acquisition exercise. The item by item level of satisfaction is further shown in the table 3 below.

Table 3: Claimants' level of satisfaction

Item	Sum	W*fx*	Mean	SI	%
Mode of service of notice	400	1416	3.540	0.708	70.8
Timing of the process was sufficient	400	1164	2.910	0.582	58.2
The assets were enumerated accurately	400	808	2.020	0.404	40.4
Level of involvement in decisions	400	750	1.875	0.375	37.5
Satisfaction with the items to be compensated	400	792	1.980	0.396	39.6
Favourable resettlement sites	400	750	1.875	0.375	37.5
Adequacy of compensation offered	400	641	1.603	0.321	32.1

SI = Satisfaction Index Source: *Authors' fieldwork, 2016*

Further on item by item measure of satisfaction, mode of service of notice has an index of 0.708 indicating that the claimants are 70.8% satisfied with the procedure. The timing of the process was also adjudged at 58.2% satisfactory level. However, the procedures leading to enumeration of assets (40.4%), involvement of claimants in key decisions (37.5%), satisfaction of claimants on items to be compensated (39.6%), unfavourable resettlement site (37.5%) and compensation offered (32.1%) all earned indexes less than 50%. These reveal very low satisfaction levels.

Challenges facing effective land acquisition exercise in Durumi

In view of the foregoing results, analysis of the challenges affecting the effectiveness of the compulsory land acquisition exercise in Durumi district is made. A descriptive statistics of the identified challenges is presented in the table 4 below.

Table 4: Descriptive statistics of challenges facing land acquisition in Durumi

Challenges	4	3	2	1	Sum	W*fx*	Mean
Difficulty in identifying claimants	318	54	21	7	400	1483	3.708
Inaccurate enumeration of assets	305	88	7	0	400	1498	3.745
Uncooperative attitude of the people	293	80	20	0	393	1452	3.695
Low assessment rate for crops and trees	334	66	0	0	400	1534	3.835
Introduction of fictitious claimants	228	19	48	7	302	1072	3.550
Refusal to accept compensation	291	53	6	6	356	1341	3.767
Late payment of compensation	337	53	0	0	390	1507	3.864
Lack of fund	311	79	0	0	390	1481	3.797
Government unwillingness to pay claimants	320	80	0	0	400	1520	3.800
Land belongs to forefathers and inheritance	339	61	0	0	400	1539	3.848
Lack of transparent conducted by government	333	67	0	0	400	1533	3.833
Greed on the part of the part of claimant	318	61	21	0	400	1497	3.743
Inadequate payment of compensation	339	61	0	0	400	1539	3.848
High cost of building construction	346	54	0	0	400	1546	3.865
Quality delivery of resettlement housing	325	75	0	0	400	1525	3.813

***4** = strongly agree, **3** = Agree, **2** = Disagree, **1**= strongly disagree, **Wfx** = Weighted frequency* Source: *Authors' fieldwork, 2016*

Reliability and suitability test of measured variables for analysis

The test of reliability of the measured variables (see Table 4) was conducted using Cronbach's Alpha (α) technique and the result indicates that the variables are consistent and stable for analysis. Thus, the alpha coefficient for the 15 dimension set variables is 0.890 which is at acceptable level of reliability. A test is further conducted to ascertain the suitability of the data set for the application of factor analysis (FA) technique and the Kaiser-Meyer-Olkin (KMO) test was used.

Table 5: Suitability test of the data set for FA

Test Technique		Value
Kaiser-Meyer-Olkin Measure of sampling adequacy		.784
Bartlett's Test of Sphericity	Approx. Chi-Square	7222.64
	Df	105
	Sig.	.000

The result shows that the value of the KMO measure of sampling adequacy was calculated at 0.784 which is greater than 0.6 marginally acceptable levels (Hair et al., 2006), hence, it

suggests a satisfactory sample size. Meanwhile the Bartlett's test of sphericity has a p-value of 0.0001 ($p < 0.5$) indicating that the data set meets appropriate criteria for FA.

The result of the Principal Component Analysis (PCA) shows that 3 components are extracted based on the Kaiser's criterion. This criterion provides for only factors or components with Eigenvalues greater than one to be extracted.

Table 6 Total variance explained from the extracted factors

Component	Initial Eigenvalues		
	Total	% of Variance	Cumulative %
1	8.362	55.747	55.747
2	1.546	10.304	66.051
3	1.357	9.048	75.099
4	.946	6.307	81.407
5	.639	4.263	85.670
6	.563	3.752	89.422
7	.479	3.195	92.617
8	.340	2.264	94.882
9	.280	1.868	96.749
10	.174	1.162	97.912
11	.123	.820	98.732
12	.102	.681	99.413
13	.044	.291	99.705
14	.032	.210	99.915
15	.013	.085	100.000

Source: Authors' fieldwork & analysis, 2016

The 3 components extracted indicates that the first component has an eigenvalue of 8.362 and variance of 55.747%, the second has an eigenvalue of 1.546 and variance of 10.304% while the third has eigenvalue of 1.357 and variance of 9.048%. They all accounted for a total of 75.099% variation in the challenges facing the effectiveness of compulsory land acquisition exercise in Durumi.

The rotation of the factors was carried out using the Orthogonal Varimax technique while factors with less than 0.3 correlation loadings were suppressed. The variables were further ordered to size within factors to allow for ease of interpretation of results and discussion of outcome.

Table 7: Factors affecting compulsory land acquisition

Factors	Components			Eigenvalue	Var (%)
Institutional factor	**1**			8.362	55.747
High cost of building construction	.873				
Introduction of fictitious claimants	.869				
Late payment of compensation	.862				
Lack of fund	.820				
Government unwillingness to pay claimant	.790				
Inadequate compensation	.781				
Quality delivery of resettlement housing	.771				
Low assessment rates for crops and trees	.758				
Lack of transparent conducted by government	.748				
Inaccurate enumeration of assets	.493				
Claimants' attitude		**2**		1.546	10.304
Difficulty in identifying claimants		.887			
Greed on the part of the claimants		.831			
Uncooperative attitude of people		.599			
Refusal to accept compensation		.535			
Sentimental value attached to land			**3**	1.357	9.048
Land belong to forefathers and inheritance			.829		

Source: Authors' field survey & analysis, 2016

From Table 7 above, factor one has 10 variables with significant correlation loadings; factor two has 4 variables loaded while factor three has a single variable loading. Therefore, these

are the 3 major factors that are identified to significantly affect the compulsory land acquisition and compensation exercise in Durumi district Abuja, FCT. These are institutional factor, claimants' attitudes and sentimental value attached to land.

Institutional challenges or factor are those created by the government as the acquiring authority, which tends to undermine the credibility of the exercise. Most times, compulsory land acquisition exercises ends up in disputes as affected persons or communities are left worst off (physically and economically) than they were prior to the exercise. As a consequence, the affected persons or communities sometimes refuse to relinquished possession of the land due to improper conduct of the acquisition processes and a prolonged litigation ensued. Other issues identified that resulted to the impasse of the land acquisition exercise were poor enumeration of assets and low assessment rates that were used for the valuation of crops and economic trees. Furthermore, government unwillingness to pay claimants in due time also contributed to the poor outcome of the exercise.

The offer of resettlement as another form of compensation was sometimes rejected by the claimants for the following reasons; housing development is capital intensive and for the affected persons to undertake would be impossible with the little amount of money being paid as compensation. Also government appointed contractors to develop the resettlement area mostly engage in sharp practices by delivering poor quality housing in order to maximise profit; sometimes the design of such resettlement homes do not meet the needs of the claimants.

The second factor is termed the claimants' attitudes which constitute 10.304% of the variation of the challenges affecting compulsory land acquisition process in the case study. Claimants sometimes put up uncooperative attitude towards the acquiring officers and the entire exercise. Although their reaction is understandable considering that their means of livelihood is being taken away from them, this attitude results to difficulties in identifying the real claimants. Some of the claimant put up certain act of greed by going into liaison with corrupt government officials to create fictitious assets and owners. In some circumstances the community leaders do give in to these corrupt practices for personal aggrandisement.

Sentimental attachment to land is a character every community exhibits. Land is seen as an inheritance from the forefathers and a link to ancestral lineage. Hence, the expropriation of communal rights and interests in land would amount to a loss of their cultural values and heritage and also the fear that it will obliterate the community's history. This factor is a portent for resistance to all forms of compensation and when not properly handled, it might derail the entire land acquisition exercise and often disputes that could linger for a longer time.

CONCLUSION AND RECOMMENDATIONS

The study examined the effectiveness of the compulsory land acquisition and compensation exercise carried out in Durumi 1 and 2, with specific objectives of examining the effectiveness of the process, satisfaction of the outcome by the community and the challenges that were encountered that affected the exercise resulting to dispute. The process involved in the compulsory land acquisition exercise in Durumi district was not effectively conducted leading to dissatisfaction among the community whose land was affected. The effectiveness of the process and largely the entire exercise was inhibited by three key factors; these were identified as, institutional factor, claimants' attitudes and sentimental value attachment to land.

The study hereby recommends that the government should improve significantly in the process of land acquisition by ensuring adequate enumeration of assets and determination of their true value. This can also be achieved by improvement in the assessment rate especially for crops and economic trees. The government should also ensure a transparent process by allowing expert/professional representation of the affected communities or persons.

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DEVELOPING AN EFFICIENT URBAN LAND MARKET IN WARRI, NIGERIA: THE CHALLENGES AND A ROAD MAP

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Land is the ultimate resources for life and economics activities. The development and maintenance of land market (LM) however involves the interaction of complex political, economic, socio-cultural and environmental control by stakeholders. An efficient LM underpins the capacity of financial institutions to advance loan for land and for land owners to invest, and also support the concept of sustainable development. This survey-based study therefore, examines the current developments in LM and articulates why efficiency is required. The survey was conducted in Warri, using a random and purposive sampling technique with a well-structured questionnaire to gather data from 125 respondents comprising of 23 registered Estate Surveyors and Valuers, 93 land owners and eight Bank officers. Data collected were analyzed using descriptive and inferential statistics with the aid of SPSS, and are presented in tables and relative importance index (RII). The result of the findings revealed that, land market is still at its early stage of development, that land market in the study area is fraught with challenges such as risk in identifying land owner (RII = 3.73), increasing land prices (RII, 3.67), informality of land market activities (RII= 3.48), land speculation (RII= 3.30) and increasing demand for land without responsive supply of land (RII = 3.28), and a complex land market in the study area. Thus, the study recommends a simplify procedures of transferring land rights transactions that is time and cost effective; documentation and registration of land transactions to prevent dispute, employment of professionals in land market transaction; a careful, regular and diligent monitoring of factors driving ensured, a land registration system that is affordable and cost effective for all citizens (rich and poor) to have access to land, introduction of Public-private-partnership approach of providing capacity and finance to support LM and a robust strategies that will ensure long-term sustainable development of an efficient LM.

Keywords: development, efficiency, estate management, land market, urban

INTRODUCTION

The development of land market has historically been linked to the development of nation's economic well-being and the quality of life of its citizen the world over. There is general agreement (World bank, 1996; Desoto, 2000; Emoh & Nwachukwu, 2016; Dawidowicz, & Zrobeck, 2017) that individual and nation's wealth is contained in its real estate market. Land protects its owner against futures uncertainties. It is the foundation for shelter in the urban centers and the sources of livelihood in the rural area. Efficient management of land will provide security to individual and facilitate growth of urban centers. The operation of land market impact greatly on nation's ability to achieve its development objectives. Land markets provide the basis for improving resource allocation and influence house price in the urban centers (Collins & Ayouz, 2006; Mahoney, Dale & McLaren, 2007; Filatova, Parker & Van-der Veen, 2009). Land market in many urban centers Warri inclusive is ineffective and inefficient. Sometimes the ability of the land owner or right holders to engage in meaningful transaction is hugely curtailed. Urban land market and access has to be efficient in order to serve the people. The importance of land market comes from its role in generating wealthier, more stable economies, more opportunities to members and if it operates efficiently, feeding into the delivery of sustainable development (Mouaiad 2011)

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The efficiency of land market varies across the world together with its openness to public scrutiny and support for the concept of sustainable development. Creating and managing dynamic land market however, are the most common reasons for government investing in Land Administration System (Williamson & Wallace, 2009). Land market exists when and whenever it is possible to exchange rights in land for an agreed amount of money or service rendered (Dowall, 1993, Harrelmann, 2002; Mahoney, *et. al.*, 2007).

The ability and capacity of banks and other financial institutions to lend money is underpinned by an efficient land market (Mahoney, *et. al.*, 2007). An efficient land market is the corner stone for economic and social development. Despite the social economic benefits accrued to a well-developed land market in urban areas, the land market in Warri remains highly underdeveloped. Like every other urban centers, it is characterized by limited information on the volume of transactions, the amount of land changing hand, the pattern of the distribution of land and land prices. Land transactions are shrouded with secrecy and there is huge ambiguity over the market operation. Most of the land development activities there are unplanned, resulting in haphazard developments with insufficient and inefficient infrastructures. In order to develop a virile strategy that will enhance efficient land market in Warri, there is need to assess and understand the condition of the market and its future prospect.

Several researches on land market exist (Gough & Yankson, 2000; Vranken & Swinnen, 2006; Williamson & Wallace, 2007; Swinnen & Vranken 2007; Mouaiad, A.L 2011;Omirin & Antwi,2012; Lasserve; Lasserve,& Selod, 2013). However, there is still a knowledge gap in Warri land market and for an economically viable urban settlement of her nature, there is need to fill this gap as this will further induce investment and investment security to would-be investors. The study therefore examined urban land market in Warri. It investigated the factors affecting the market. Ascertain the forces that drive the market as well as ascertaining the challenges associated with the efficient and effective operation of the market with a view to proposing a workable pathway towards a sustainable land market development.

LITERATURE REVIEW

Land markets attract wide participation, all over the globe. Market activities receive intense analysis from economists and bankers, investors and developers, and they interest millions of people (Bell, 2007). Meanwhile, how to build an efficient land market remains a mystery. Currently, the demand for urban land for housing, commercial use and for industrial expansion is high and on the increase. The demand for urban land is everywhere, however it is more serious in developing nations and this can only be met by redeveloping, by efficiency using urban space or converting rural land to urban land (Koroso, 2011). Once the land is made available, people can access it through various means. In areas where people are dynamic, distinctly, land market plays very crucial role in terms of making land accessible for residential, commercial, industrial purposes and for expansion of urban infrastructure and social amenities.

Land market according to Palmer *et. al.* (2009) are mechanisms by which rights in land and housing, either separately or together, are voluntarily traded through transactions such as sales and leases. Land is an important input for housing. Unlike any other commodities, land is immovable (Dale, *et. al.*, 2007). When transaction on land is done from legal perspective, only the rights can be moved from a seller to a buyer. This makes the need for special arrangement in order to have a functioning urban land market. Land market performs the functions of bringing buyers and sellers together, set price for land , allocates land and play an important role in ensuring that land is efficiently used (Lall, Helluin, Freire & Rajack, 2009). For the land markets to function well according to Wallace *et. al.* (2007), three basic ingredients have to be fulfilled: land itself, land rights and complex commodities. Wallace (2009) also identified five evolutionary stages in the process of land market development. These stages are land, land right, land trading, land market and complex property market. These stages are related and linked. As the market moves from land to the next stage, the level of complexity increases. Gradual land market development takes the market from land to the complex property market such as the real estate market. According to Dale (2000), understanding of the evolution improves our understanding of the market and helps us manage land market in a better way.

As noted earlier, land market is one of the ways through which many people can gain access to land in the urban areas. It has many forms. It can exist in the form of land sales and land lease where people can transfer ownership/use rights in land or housing. Land right can take place in a formal land market (registered and titled rights in land transfer) or may happen through informal channels (without official recognition (UNECE, 2005). Urban land market can be affected by factors such as demand and supply, land sales and land lease. Other factors includes spatial planning speculation that affects land price, formality and informality of urban land market (Thirkell,1996; UNESCAP,1997; Desoto, 2000; Cruzel do-sul, 2000; Sivam,2002; UN-HABITAT,2003b; Omirin et.al.,2004, Enemark, 2010 Lasserve, et.al., 2013). According to Bell (2007) efficient land market leads to reduction in service cost time (registration of property transaction and information provision. Fast service delivery reduces risk of bribery. It has the ability to solve the land market dispute in timely and cheap fashion. Effective land market achieves a project target set. It serves and reaches out to all participants including the poor. Effective urban land market also enforces contracts that protect both the buyer and the seller (koroso, 2011). In urban land market there are many actors such as government at all levels, developers, real estate investors, landowners, users and financial institution (Hans & Wangs, 2003;Tian & ma, 2009, Wu, Gyourko & Deng, 2010). All these actors largely have different stake and interests in the land market.

Freire, et. al., (2007) have found out that land market increases access to land for those people who have difficulty acquiring land through the customary mechanisms, inheritance and state allocation. Access to land market through land market becomes reality when a seller is ready to transfer his/her land rights or land to a buyer who can afford to pay the market price. Jenkins (2001) clearly noted that formal land market in many developing countries will not act in the foreseeable future on the way it can be beneficial especially for urban poor. Though he recognized the attempt made to redistribute land through state allocation policies, yet he argues that better initiative has also severe limitations due to institutional and political constraints. Jekins (2001) therefore calls for a better way of land allocation mechanism that will address the need of larger segment of urban centers. In formal land delivery system, allocation and transfer of land conforms to existing laws such as mandatory registration and certification, planning regulations, building codes and standards (kinonde, 1995; Sivam, 2002; Enemark, 2010). Informal land market violates few or all of the procedures declared by government. Land in this case can particularly be obtained or occupied without permit or without undergoing registrations. Local leaders can allocate or sell land illegally (Kinonde, 1995; Enemark, 2010). There is a general consensus (Dale & Baldwin, 2000, Arvanitidies, 2006; Dawwidowicz, Radzewiicz & Renigier-Bulozor, 2014; Emoh & Nwachukwu, 2016) that in order for a land market to work, there must be: a clear definition and sound administration of property rights; a minimum set of restrictions on property usage consistent with the common good; the transfer of property rights must be simple and inexpensive; there should be transparency in all matters; and there must be an availability of capital and credit.

For urban land market to function well and to meet the expectations of the people, it should be established on a solid ground of good land governance. An effective and efficient land market is a crucial component of any successful market economy; it brings a variety of advantages to nations and its citizens.

STUDY AREA AND METHODOLOGY

In the Niger Delta Region of Nigeria, one city that has had its fair share of urban-rural pull is Warri in Delta State. Its history dates back to the 15th century, when it was visited by Portuguese missionaries (Ekeh, 2005). Warri is located on northern bank of Warri River about 30miles (48Km) upstream from the port of Forcados on the Bight of Benin. It is a conurbation of several communities including Warri, Effurun to the North, Ekpan to the West, Aladja to the East and the Bight of Benin to the Southwest. It has a coastline of approximately 160km along the Bight of Benin. It occupies an area of about 499.81km2. Located between Longitude 50 41‟ 39.58‟‟‟ E to Longitude 50 46‟ 11.42‟‟‟E and Latitude 50 31‟ 12.37‟‟‟N to Latitude 50 48‟ 25.35‟‟‟N. Warri Metropolis is drained by an intricately woven network of rivers, creeks, river outlets and canals.. There is marked absence of imposing hills that rise above the general land surface. The area experiences long raining season and short dry season. The rapid urban growth which Warri has experienced stemmed from its position as the head quarter of Warri South LGA and the zonal headquarters of

federal parastatals as well as the oil and gas industry such as Nigeria National Petroleum Company (NNPC), many shipping and allied companies which provided employment opportunities. The establishment of Warri Refinery and Petrochemical Company as well as the Aladja Shell Complex and its associated companies has no doubts contributed to the rapid population growth as well as the urbanization process. All these make the city of Warri suitable for a study of this nature.

The paper reviewed literature on land markets and adopted a survey research design. The nature of analysis in this study is both descriptive and inferential. Thus, the study uses primary data, a questionnaire to assess how the people perceive the operations of land market. The survey was conducted in Warri, Delta State between July and August, 2017. A Self-administered questionnaire with close ended questions suitable for quantitative analysis was design to elicit information from the major players in land Warri land market. The questionnaire was structured on a 4-point Likert scale. Respondents were requested to indicate their perception on the subject based on their knowledge and experience. The study adopted a random but purposive sampling technique to select key respondents from all the categories of target population so as to ensure that the right respondent with relevant knowledge and experience on the subject matter of the study are adequately selected. A total of 125 respondents comprising 23 registered Estate Surveyors and Valuers, 93 land owners and eight bank officials constitute the sample size in which the instrument was applied. The choice Estate surveyors, land owners and bank officers is premised on the fact that apart from being the major players in land market operations , they also understand the workings of the market, and can provide a reliable and adequate information towards achieving the study`s objectives. The analysis was done with the aid of Statistical Package for Social Science (SPSS). The contribution of each of the item to the study was examined and the rating of the attributes in terms of their significance and importance was done by the use of Relative Importance Index (RII) which was computed using equation below:

$$RII = \frac{\Sigma W}{AxN}$$

Where: W= factors by the respondents
A= highest weight
N= total number of respondents

RESULTS AND DISCUSSION

The section focused on the data collected, collated and analyzed. The results are presented in chart and tables with discussions preceeding chats and tables.

Urban land market requires some actors/operators (which are refer to in this study as land market participants) to be effective. Figure1 presents the participant in Warri Land market. The analysis revealed that land owners (33.6%), land users (26.4%) and Estate Surveyors and Valuers (17%) form the major participants in land market in the study area. Other participants include Property developers and real estate investors (7.2%) respectively, local and state ministries of land and financial institutions (3.2%). It can be deduced from the figure therefore that a large proportion (76.8%) of the land market operators/participants in Warri are the land owners, land users and the Estate Surveyors and Valuers that represents the main professionals in land matters by training

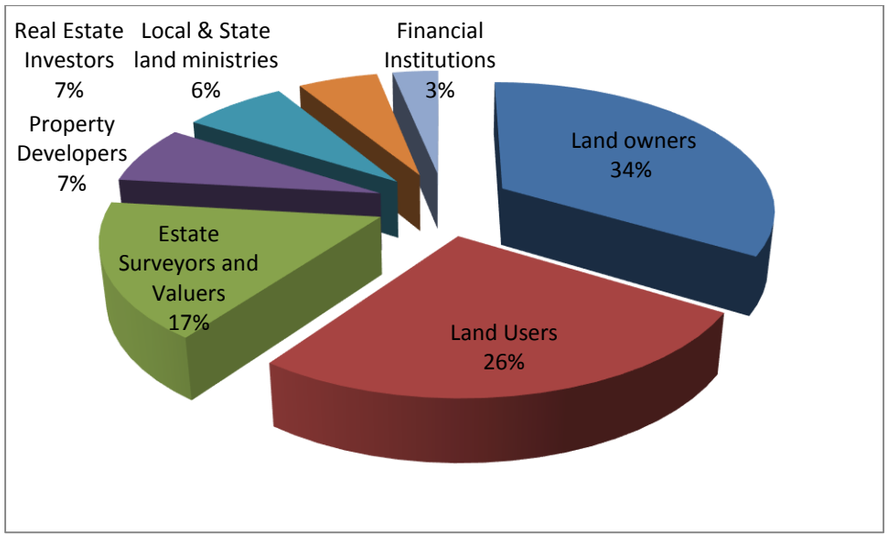

Figure 1. Showing Major Participants in Warri Land Market
Source: Authors' fieldwork (2017)

One of the objectives of this paper is to examine the factors that drive Warri land market. The research undertaken established that there are so many factors that drive land market. Table 1 presents some of the drivers as indicated by respondents. From the summary of the results in figure 1, it can be observed that key factors like land holding pattern (RII = 3.64), demand and supply of land (RII = 3.56) and Security of land title (RII = 3.54) constitutes the major drivers of land market in the study area. Other factors includes the economy of the environment and community involvement in land market activities ranking 4th with (RII = 3. 52) respectively. Next to this in hierarchy is the availability of land (RII = 3. 36), level of urbanization (RII = 3.16) and increase in real estate development in 8th position with (RII = 2.88).other factors with less importance index local/state ministries involvement in land market (RII = 2.34), professional involvement in land market operations (RII = 2.20.) in the 10th position while the least factor is the availability of credit from financial institutions (RII = 2.13). The ranking of land holding pattern, demand and supply of land and security of title to land could be seen to be in consonant with Bertaud, (2010) of the main factors that drive land market in any urban area. Again the holding pattern of land is very important to any land transaction as this will provide confident to would be buyer and other participants in such transactions. The demand for land and the supply side is also imperative if an efficient land market must be developed. If demand is high and supply is not responsive accordingly, it tends to hamper effective market operation in any urban land market area. Again, the security of title to land is an important factor. The more secure the title, the more virile the market and vice versa.

Table 1: Showing Ranking of Factors driving Land market in Warri

Effects	SA (4)	A (3)	D (2)	SD (1)	Total	RII	Ranking
Land holding Pattern/structure	84 336	37 111	4 8	0 0	125 455	3.64	1st
Demand and supply of land	62 248	63 189	10 20	0 0	125 434	3.56	2nd
Security of land title	76 304	40 120	9 18	0 0	125 442	3.54	3rd
Economy situation of Warri	78 312	38 114	5 10	4 4	125 440	3.52	4th
Community involvement in land market operation	63 252	58 174	49 8	0 0	125 434	3.52	4th
Land Availability	65 260	44 132	12 24	4 4	125 420	3.36	6th
Level of Urbanization	20 80	97 291	8 16	0	125 387	3.16	7th
Increase in real estate development	22 88	54 162	49 96	0 0	125 346	2.88	8th
Local & state ministries	0 0	60 180	48 98	17 17	125 293	2.34	9th
Professionals involvement in land market operation	48 192	69 209	8 16	0 0	125 399	2.20	10th
Availability of credit from financial institutions	9 39	20 60	74 148	22 22	125 226	2.13	11th

Source: Source: Authors' fieldwork (2017). (RII- Relative Importance Index)

This study set out as one of its objectives, the challenges hindering land market development. Lasserve, *et. al.* (2013) noted that Land market development has been limited by series of

factors including land price unaffordability for vast majority of urban households, weak financial system wide spread corruption in land transaction and other similar factors. Table 2 revealed that respondents were of the opinion that risk in identifying the actual land owner (RII = 3.73) is the greatest challenge hindering effective land market in the study area. This implies that identifying the real owner of land in the area pose some difficulties. This can be attributed to a situation where different people especially in the community lay claim to the ownership of one particular landed property. The risk of identifying who the authentic owner is becomes a crux and this can have a severe impact in land market efficiency and effectiveness. Another challenge inhibiting land market development as observed in the table 2 is the issues of increasing land prices (RII = 3.67). This can be attributed to high demand for land earlier, identified as one of the major factors driving the land market in the study area. When supplies cannot adequately respond to demand all things being equal the price will skyrocket as discovered in the study area. Informality of land market activities in the study area (RII = 3.48) presents another challenge and ranked 3rd, location and accessibility (RII = 3.46), ranked 4th in hierarchy as indicated by respondents from the results of the analysis. Land speculation (RII = 3.30) and increasing demand for land (RII = 3.28). Other challenges of effective land market development in the area include sharp practices of land market operators (RII = 2.95), Local/State government influences in land market (RII = 2.35), inadequate supply of land (RII = 2.16) and Formality level of land market (RII = 1.88) occupies the least ranking from behind. This implies that though these three factors pose challenges to urban land market development in the study area, their impact is not as huge as that of the first 6 factors in table 2. However, all these factors culminate to hinder effective land market development and if adequate measure is not put in place to arrest the situation, the advantages that come with efficient and effective urban land market may elude the study area.

Table: 2 Showing the challenges of effective Land market development in Warri

Challenges	SA (4)	A (3)	D (2)	SD (1)	Total	RII
Risk of identifying Land owner	108 432	4 12	9 18	4 4	125 446	3.73
Increasing land prices	73 292	52 156	0 0	0 0	125 448	3.67
Informality level of land market	59 236	57 171	5 10	4 4	125 421	3.48
Location and accessibility	60 240	52 156	13 26	0 0	125 422	3.46
Land speculation	50 200	67 201	4 8	4 4	125 413	3.30
Increasing demand for land	33 132	80 240	12 24	0 0	125 396	3.28
Activities of land market operators	10 40	107 321	0 0	8 8	125 369	2.95
Local/State government influences in land market	8 32	57 171	31 62	29 29	125 294	2.35
Supply factor of land	25 100	8 24	41 82	51 51	125 257	2.16
Formality level of land market	4 16	4 12	88 176	29 29	125 233	1.86

Source: Authors' fieldwork (2017). (RII- Relative Importance Index)

Perhaps, one of the far reaching effects of land market is that it should lead to an improved real estate development. It is evident from table 3 that land market activities/operation have some effect on real estate development in the study area. The table represents respondent's opinion on some statements on land market and its effect on the current state of real estate development in the city. The result shows the mean and standard deviation of the distributions. A 4 point Likert format questionnaire of 1-4 was adopted where 4 is ascribed to strongly agree and 1 to strongly disagree respectively. The Ranking of this statement indicates that land market in the study area mostly lead to court litigation with mean of 3.4720 ranking first. However, this study did not probe into the factors that are responsible for court litigations. The results also show that land market is still very complex with ambiguities with a mean of 3.4320 in 2nd position. Ownership dispute is also said to revolve around land market, this is accounted for with a mean of 3.0880. Also, transactions in land market is said to be on the increase. It can also be inferred from the table that most of the respondents strongly agreed that land market in the area support and enhance real estate development to a great extent, this ranked 5th with a mean value of 2.7840. From the results

it is evident that most of the respondents agreed that land market in the study area is still emerging and this is drastically affecting real estate development, therefore, a lot is still required to develop land market to its efficiency and effectiveness in the study area.

Table: Table 3 Descriptive Statistics of land market effect on real estate development in Warri

	N	Minimum	Maximum	Mean	Std. Deviation	Ranking
Land Market Lead To Court Litigation	125	1.00	4.00	3.4720	.66691	1st
Land Market Process Is Complex	125	2.00	4.00	3.4320	.55845	2nd
Land Market Creates Ownership Dispute	125	1.00	4.00	3.0880	.92471	3rd
Land Market Increase Land Transaction	125	1.00	4.00	2.8800	.51744	4th
Land Market Enhance Property Development	125	1.00	4.00	2.7840	.57619	5th
Land Market Affect Security Of Land Title	125	1.00	4.00	2.7120	.82125	6th
Land Market Is Not Efficient And Effective	125	2.00	4.00	2.6320	.64177	7th
Land Market Enhances Access To Finance For Real Estate	125	1.00	4.00	2.0560	.58619	8th
Land Market Is Currently Booming In Warri	125	1.00	4.00	2.0400	.64006	9th
The Economy Does Not Affect Land Market	125	1.00	3.00	1.4080	.55498	10th

Source: Authors' fieldwork (2017).

CONCLUSION AND RECOMMENDATIONS

This research effort has been able to empirically investigate the level of development of land market in Warri Delta state, Nigeria, with a view to identifying the challenges and proposing a workable means towards improving the current state of the market. The study revealed that land market is still at its early stage of development and that the current situation of the market is not encouraging to make it a favorable avenue for real estate development at a scale and affordable rate. It is evident that land market in the study area is fraught with various challenges such as risk in identifying land owner (RII = 3.73), increasing land prices (RII, 3.67) and informality of land market activities (RII= 3.48). Other challenges are land speculation (RII= 3.30) and increasing demand for land without responsive supply (RII = 3.28). Various factors like land holding pattern demand and supply of land, security of title community involvement in land markets drives land market in the study area. It is also important to note that these factors affects land market operators in land transaction. Ownership dispute is also said to revolve around land market. Although, transactions in land market is said to be on the increase and land market in the area support and enhance real estate development to a great extent, but in all the land market in the study area is still very complex and requires a robust land market strategies that will enhance effective and efficient real estate and economic development. From the above conclusion therefore, the following recommendations were made:

- The actors in land market should simplify the procedures of transferring land rights. This can be achieved through minimizing the number of procedures, the times and cost that is required to seal a deal.
- The services of professionals should be employed to enhance good decisions and judgment in land related matters.
- Land transactions should be documented and registered to avoid dispute among land owners.
- Government policies and regulations should be observed as these will prevent the challenges confronting land market in the area.
- Land should be put to their highest and best use to promote efficiency and effectiveness.
- A careful and diligent monitoring of the driving force of land market should be done regularly.
- There should be a land registration system that is affordable and cost effective so that all citizens (rich and poor) can have access to land.

- Public-private-partnership approach should be introduced to provide capacity and finance to support LM.
- A robust strategies that will ensure long-term sustainable development of an efficient LM is also required.

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ACCESS TO RESIDENTIAL LAND IN MINNA, NIGERIA: METHODS AND CONSTRAINTS

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Access to land is central to housing delivery and, therefore, an essential element in urban development. The methods and procedures for access can have strong implications for housing and welfare. The study investigated access to residential land for private development by households in Minna, the Niger State capital. The objective was to ascertain the prevalent methods of access to land and the constraints to access. The research design was cross-sectional survey. Data was collected with structured questionnaires from 450 households and 20 consulting firms in land agency. Data analysis employed mean, frequency distribution and two-tailed independent sample t-test. The results revealed that the most common method of access to land is purchase from private landowners. In addition, the constraints to access to land manifest in affordability, security of tenure and ease of transaction. Affordability measured by general high cost of land and high cost of land relative to household income is the most significant constraint to access to land. The t-test result showed t statistic of 0.3350 and p value 0.741, an indication that there is no significant difference between households and consultants on their perceptions on the constraints to access to land. The findings suggest that the Land Use Act, 1978 is not fulfilling its goal of making land available to Nigerians. An implication of the research is its potential as framework for land market reforms.

Keywords: Access to land, constraints to access, land accessibility, urban housing market, urban land market

INTRODUCTION

Access to land is central to housing delivery and, therefore, an essential element in urban development. It is a fundamental basis for food production, human shelter and other economic activities (UN-Habitat, 2008). Due to rapid urbanisation, urban land in developing countries is under pressure. In urban housing markets and sub-markets in which households build rather than buy their homes, prevalent in developing countries, access to residential land by households is quite a sensitive issue. Achieving secure access to land by urban households in these countries, especially for the low-income has become a critical issue. The methods and procedures for access and the constraints to access can have strong implications for housing and welfare of the urban populace.

Nwuba (2015) found that access to land is an important factor to housing affordability in Kaduna State. The earlier study of Arimah (1997) similarly found that access to land is a key determinant of the probability of homeownership in Ibadan, Nigeria. Facilitating access to land and securing the means of paying for the land is a most important prerequisite for the development of sustainable human settlement policy (Aluko, Olaleye, & Amidu, 2004). The implication is that measures to resolve the country's endemic housing problems have to adequately address the issue of access to residential land.

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Access to land has been one of Nigeria's most daunting urban development problems especially with respect to housing delivery. In 1978, the Federal Military Government promulgated the famous Land Use Act with the goal of making land readily available to Nigerians. Notwithstanding, access to land remains one of the most difficult obstacles to urban housing delivery (Ogu & Ogbuozobe, 2001; Olugbenga & Adekemi, 2013; Owoeye & Adedeji, 2015; Udechukwu, 2008). Some researchers have even argued that the Act itself poses constaints to accessing land and therefore constitutes hindrance to housing delivery (Akeju, 2007; Ayedun & Oluwatobi, 2011; Bello, 2009; Ugonabo & Emoh, 2013).

Given that households are the predominant providers of housing in the country, it is important to ascertain how they access residential land and the constraints they face in doing so. Moreover, as rapid urbanisation has placed severe pressure on urban land and housing, such an investigation is more relevant in the urban than in the rural area. Existing studies in the area in Nigeria's land markets include Gbadegesin, Van der Heijden, and Boelhouwer (2016) who investigated land accessiblity factors in housing provision in Lagos, Stanley and Orobowale (2011) who studied land accessiblity for housing development in Abuja, and Babatunde, Kemiki, Abdulkareem, and Fabunmi (2014) who researched the activities of land administration machineries in Abuja and Minna. However, these studies did not focus on determining the diverse constraints that households face in their bid to access urban residential land from the perspectives of the households themselves and the consultants who act on behalf of households. The closest to the current study is Nwuba (2017) who researched the role of access to land as a constraint to homeownership in Kaduna State. Given that the study covered only Kaduna State, extending similar studies to towns and cities in other states is necessary. There are thus important research gaps in Nigeria's urban land market literature which need to be filled. Consequently, this study attempted to fill the gaps by investigating the methods of access and constraints to access to residential land in Minna, Niger State. The objective was to determine the prevalent methods of access to urban residential land by households and the constraints that households face in their bid to access land.

CONCEPTUAL ANCHOR AND REVIEW OF RELATED LITERATURE

In Nigeria as in many developing countries, the primary method of access to homeownership is a gradual building process by households. Access to residential land by households is therefore generally a prerequisite for homeownership. Thus, Nigeria's housing market is predominantly in undeveloped plots (Federal Government of Nigeria [FGN], 2009). However, there are challenges to accessing land in the country. These challenges manifest in various aspects in different parts of the country. In Rivers and Ogun States, the most important land access constraining factors are respectively high cost of land, security of tenure, and difficulties in land transactions and transters (Chukwuemeka & Kalu, 2016; Oladehinde, Popoola, Fatusin, & Adeyeni, 2017). In Akure, Southewest Nigeria, the challenges to urban land acquisition are security of tenure and availabilty of land (Owoeye & Adedeji, 2015). Furthermore, in Lagos, Gbadegesin et al, (2016) found that security of tenure is the most important accessiblity factor while availability is the least. In Kaduna, findings from Nwuba (2017) revealed that access to land measured by affordability and ease of transaction poses constraints to homeownership. General high cost of land is the most important constraint, followed by high cost of land relative to income. On the other hand, availability and security of tenure are not constraints.

Drawing from various sources, the UN-HABITAT (2008, p5) defined access to land as 'opportunities for temporary or permanent use and occupation of land'). It stated that land access is obtained by exchange, direct occupation, through membership of a family and kin groups or by allocation by government or other land owners. Omirin (2002) land accessibility study provides a fuller understanding of the term. Omiri conceptualised land accessibility with four elements, namely, availability, affordability, security of tenure and ease of transaction. Implicit in the conceptualisation is that for land to be described as accessible to a group, the land should be usable and physically available with secure trenure and be economically affordable to the group with ease of transaction to obtain it. A growing number of Nigerian studies have employed this conceptualisation to analyse or explain access to land (See for example, Aluko, Olaleye, & Amidu, 2004; Babajide, 2014; Gbadegesin et al, 2016; Odum & Ibem, 2011; Udechukwu, 2008).

Sequel to Omirin (2002), Nwuba (2017) developed sets of variables to measure constraints to access to land based on the four elements of land accessiblity. The variables compise two for affordability, four for availability, five for security of tenure and two for ease of transation. Omirin (2002) and Nwuba (2017) guided this study. The study evaluated the constraints to accessing residential land by households in Minna based on the variables developed in Nwuba (2017) to measure the four elements in Omirin (2002). It assessed how constraints to access to land manifest in these variables.The literature is further reviewed with respect to these four elements of land accessibility.

Availability

The availability of residential land in any city is limited to the portion of land designated by urban planning for residential development, and more specifically, the portion of it that is in the market or can be brought to the market in the short run. Useability of land is an important factor in availability. Residential land may be available from formal sources such as the government or informal sources such as private landownwers. Therefore, access to land can be obtained through various methods from these sources. Private landowners including individuals and families play important roles in the availability of urban land. Ogu and Ogbuozobe (2001) identified purchase from 'government acquired areas', acquisition from landowners and acquisition through traditional land holdings as the sources from which Nigeria's urban dwellers can legally acquire land for housing development. However, in Abuja and Minna, Nigeria, residents access land mostly by purchase from informal land markets (Babatunde et al., 2014).

Rakodi and Leduka (2004) concluded that the informal land delivery systems are the main channels of land supply for housing in African cities. Further, that the informal systems play larger role in land delivery than the formal and public-sector land systems and are effective in delivering land for housing. As Durand-Lasserve (2006) put it, for the urban poor and the substantial segment of the low- and moderate-income groups, the only option to access land and housing is through the informal markets. In Nigeria, residential land is also accessed through group purchase from communal lands by staff cooperative societies in the public service on behalf of members. The method has advantages such as enabling access to urban land with secure tenure at reduced costs and taking away the risks which individual buyers could face due to ignorance in land market operations (Odum & Ibem, 2011). Availability of land is important in accessing land because land has to be available before it can be accessed.

Affordability

Affordability is a measure of ability to pay. It is a function of a household's disposable income. Household income and the cost of land are therefore important in accessing land. Nwuba, Kalu, and Umeh (2015) found that cost of land has a negative impact on urban homeownership affordability. This suggests that high cost of urban residential land prevalent in Nigeria's cities is a deterrent to homeownership. Similarly, Makinde, (2014) observed that high price of land is a major constraint to urban housing delivery in Nigeria. Also, Nwuba (2017) found that high cost of land is a deterrent to accessing land in Kaduna State. Aluko, et al (2004) indicated that the costs of acquiring land in the informal markets in Lagos State could be as high as four times the cost of acquiring equivalent plot of land from the state government.

Affordability is a key factor in land access. No matter how much of residential land is available in a city, a household cannot access it if it cannot afford it.

Security of Tenure

The level of investment a household will make on land will be related to the degree of their actual or perceived security of tenure. In China, Ma, Heerink, Ierland, and Berg (2013) found that perceived tenure security significantly affects investments in agricultural land. Drawing from various sources, the UN-Habitat (2008, p5) defined security of tenure in three ways. First, as the degree of confidence that land users will not be arbitrarily deprived of their rights over land. Second, "the certainty that an individual's right to land will be recognised by others and protected in cases of specific challenges", and third, "the right of all individuals and groups to effective government protection against forced evictions". However, security of tenure does not derive only from formal legal forms but also from other aspects and instruments (UN-Habitat, 2003). Moreover, to households, perceptions of tenure security are as important as legal status (Payne, 2001). Therefore, secure tenure rights should be

promoted as a means of achieving sustainable urban development (UN-Habitat/OHCHR, 2016).

Land title registration with evidence of certificates of occupancy and formal documentation of land transactions are important aspects of security of tenure. Chinese households that consider land certificates important for the protection of land rights make significant investments of agricultural land (Ma et al, 2013). However, in Nigeria, land purchasers do not usually register their titles or make formal documentation of their transactions due to such factors as ignorance, high processing costs, delays and lengthy process involved, extortion of money by officials, and government insensitivity (Babatunde, et al., 2014; Olanrele & Agbato, 2014). In Lagos State, problems in land registration include high land charges, lack of institutional framework, and high cost of registration (Thontteh & Omirin, 2015). In addition, findings revealed dissatisfaction in title registration process by land market operators in Nigeria (Babajide, 2014). Lack of security of tenure might hinder households from accessing land.

Ease of Transaction

It is important that transactions to access land should be with relative ease, otherwise access might be constrained. Ease of transaction can be considered in terms of the processes of getting through the land market and registering land transactions to obtain valid titles. The World Bank (2012) 'Doing Business' ranked Nigeria 180 out of 183 economies in registering properties with 13 procedures, 82 days and 20.8% of property value. This report corroborates World Bank (2009) report which observed that the costs for formalising land transactions in Nigeria were cumulatively the highest in the world. In addition, Aluko, et al (2004) noted that the procedure for perfection of title after purchase of land in Lagos State is cumbersome, bureaucratic, costly and lengthy. High transaction costs can cause market failure because they limit the ability to transact (Marx, 2007). Under the Land Use Act, 1978, alienation of urban land requires the consent of the Governor, a provision that renders the process cumbersome. The consequence of these difficulties is that transactions are forced outside official channels and most titles are informal. As Nwuba (2015) put it, informality predominates Nigeria's urban land markets.

In Nigeria today, access to urban residential land by households is a burning issue partly because of the significant role households play in urban housing delivery.

RESEARCH METHODOLOGY

The research was a cross-sectional survey. There were two samples – households and consultants in land agency. The survey utilised structured questionnaires adapted from Nwuba (2017). The questionnaires contained two sections, one measuring land acquisition process and the other for constraints to access to land. Households who had land were asked the source and method of their land acquisition while those who had not were asked the reasons why they did not have. On the other hand, the consultants were asked to rank variables in the frequency of the methods they use to acquire land for their clients. Constraints to access to land had four constructs measured by 13 variables structured on 5-point Likert model with 'strongly agree' rated 5 and 'strongly disagree' rated 1. A neutral point was rated 3 while 'strongly agree' and 'strongly disagree' were rated 4 and 2 respectively. All the respondents rated the constraints on the scale. The data were collected through paper by the researchers and trained assistants. Four people conducted the survey for a period of one month. To address the problems of incomplete data and non-response which are typical of surveys, the survey strategy involved continuing sampling until usable responses to cover the required sample size were obtained.

The consultants sample comprised law firms and firms of estate surveyors and valuers. Questionnaires were administered on 25 firms that were identified and agreed to participate in the survey. Twenty questionnaires were returned and used in the analysis. In addition, 450 households were sampled from a population of 80,519 regular households. The 2006 population was projected to 2016 based on the United Nations estimate of national annual average population growth rates for the period - 2.64% (2005 – 2010) and 2.67% (2010 – 2015) (United Nations, Department of Economic and Social Affairs, Population Division, 2017). The Taro Yamane Sample size formula was used to determine the sample size at 95% confidence interval. The Taro Yamane sample size formula is a simplified formula for calculating sample sizes and is given by:

$$n = \frac{N}{1+N(e)^2}$$

Where n = sample size required

N = the population size

e = the level of precision

(Singh & Masuku, 2014)

Thus, the sample size for the estimated population of 80,519 households at a precision level of ±5% is

$$\frac{80{,}519}{1 + (80{,}519 \text{ x } (0.05^2))} = 398.02$$

A minimum sample size of approximately 400 households is required for the study. A sample size of 450 was consequently adopted.

The sampling design was stratified two-stage sampling scheme with equal allocation. The population was first stratified into three comprising households who had developed their land, households who had land but were yet to develop them and households who did not have land. In the second stage, cluster sampling was employed with the wards as clusters. Households were then sub-sampled in the wards through random process. The survey covered the high, medium and low density residential districts in Minna. Data analysis employed mean, frequency distribution and two-tailed independent sample t-test.

Minna is the capital of Niger State in North-central Nigeria. It was chosen for the study because as a state capital access to urban residential land is an issue of public importance. In addition, its inhabitants come from diverse cultural backgrounds. This made possible a blend of respondents that is appropriate for a study of this nature. Like in other cities in the country, the effects of urbanisation manifest in areas such as land and housing. Information from the state office of the National Population Commission indicates that the city had a population of 426,270 as of 2012. The figure is a projection from the 2006 national census population of 348,788. The two local government areas in the town, Bosso and Chanchaga had a combined regular household population of 61,940 by the 2006 national census (National Population Commission, 2010).

RESULTS

This section presents the results. It covers the respondents' demographics and the descriptive and inferential statistical analyses. The results from the analysis of the responses measured on Likert scale format were interpreted as follows:

4.50 – 5.0 Strongly agreed

3.50 – 4.49 Agreed

2.50 – 3.49 Neutral

1.50 – 2.49 Disagree

1.0 – 1.49 Strongly disagreed

Respondents' Demographic Profiles

Table 1 contains the summary statistics of the profile of the households' sample. A majority of 74% were male while 26% were female. A majority of 70% were married while 30% were single. Also, 40 – 49 years age group comprised the largest proportion with 30.4% while 50 years and above comprised the least with 13.6%. From the data, the sample has a good spread across various categories of households and is therefore a good representative of the population.

Table 1: Summary Statistics of Respondents' Demographic Profile (Households)

Characteristics	Response category	No of respondents	Percent	Cum percent
Sex	Male	333	74.0	74.0
	Female	117	26.0	100.0
Marital Status	Married	315	70.0	70.0
	Single	135	30.0	100.0
Age bracket of respondent	Less than 30	123	27.3	27.3
	30 – 39	129	28.7	56.0
	40 – 49	137	30.4	86.4
	50 and above	61	13.6	100.0
Household Income Bracket (Naira per month)	18,000 and below	3	0.7	0.7
	18,001 – 48,000	109	24.2	24.9
	48,001 - 78,000	88	19.6	44.5
	78,001 – 108,000	69	15.3	59.8
	108,001 – 138,000	20	4.4	64.2
	138,001 – 168,000	13	2.9	67.1
	168,001 – 198,000	18	4.0	71.1
	Above 198,000	35	7.8	78.9
	Did not indicate	95	21.1	100.0

Source: Authors' Field Survey, 2017

Similarly, Table 2 contains the summary of demographic profile of the consultants' sample. The firms are mostly small, which reflects the market. As much as 65% employ 10 or less staff. However, as much as 40% of the firms have rendered service in land agency for 15 to 20 years. The age group of 40 to 49 constituted the largest proportion of 45%. Again, the sample covered firms of diverse sizes and years of experience and male and female respondents across a range of age brackets and years of experience. It is therefore also considered suitable for the study.

Table 2: Summary Statistics of Respondents' Demographic Profile (Consultants)

Characteristics	Response Categories	No of respondents	Percent	Cumulative percent
Firm's staff strength	1 – 5	7	35.0	35.0
	6 – 10	6	30.0	65.0
	11 - 15	5	25.0	90.0
	16 – 20	2	10.0	100.0
No of years firm has rendered service in land agency in Minna	1 – 5	0	0.0	0.0
	6 -10	4	20.0	20.0
	11 – 15	5	25.0	45.0
	16 – 20	8	40.0	85.0
	Above 20	3	15.0	100.0
Respondent's sex	Male	15	75.0	75.0
	Female	5	25.0	100.0
Respondent's marital status	Married	17	85.0	85.0
	Single	3	15.0	100.0
Respondent's age group	Below 30	2	10.0	10.0
	30 – 39	6	30.0	40.0
	40 – 49	9	45.0	85.0
	50 and above	3	15.0	100.0
Respondent's Experience (in years)	1 – 5	6	30.0	30.0
	6 – 10	5	25.0	55.0
	11 – 15	3	15.0	70.0
	16 – 20	4	20.0	90.0
	Above 20	2	10.0	100.0

Source: Authors' Field Survey, 2017

Land Acquisition Methods

Table 3 contains the results on land acquisition means and sources from the households' data. The results indicate that households in Minna acquire land mostly through purchase from private landowners. A majority of 57.7% acquired their land through this process. This is followed by acquisition through inheritance which accounted for 25%. A small minority of 17.3% acquired their land through direct government allocation.

Table 3: Summary Statistics of Land Acquisition Means and Sources (Households)

Variable	No of respondents	Percent	Cumulative percent
If you have plot of land or have built your house, how did you acquire the land?			
Direct state government allocation	34	11.3	11.3
Direct local government allocation	18	6.0	17.3
Purchase from private landowners	173	57.7	75.0
Inheritance from family/community land	75	25.0	100.0
If you purchased your land, how did you buy it?			
Through a registered estate surveyor			
Through a lawyer	15	8.7	8.7
Through a local land agent	25	14.4	23.1
Direct from the landowner	66	38.1	61.2
Through other intermediaries	65	37.6	98.8
	2	1.2	100.0
If you do not have a plot of land yet, what is the reason?			
I cannot afford to buy land due to high cost of land			
I cannot afford to buy land because my income is low	54	36.0	36.0
I have not found suitable land to buy	87	58.0	94.0
	9	6.0	100.0

Source: Authors' Field Survey, 2017

The results indicate also that land acquisition by purchase in the city is professionalised to a reasonable extent. A majority of 61.2% purchased their land through agents. Interestingly, however, the local land agents play the largest role, accounting for 38.1% of all land purchases and 62.3% of purchases made through agents as against formal professionals who jointly accounted for only 23.1% of all purchases or 37.7% of purchases made through agents. Law firms came a distant second with 14.4% of all land purchases and 23.5% of purchases made through agents. Firms of estate surveyors and valuers accounted for a mere 8.7% of all purchases and 14.2% of purchases made through agents. It is noteworthy that land owners still play significant role in the market, coming a close second to local agents with 37.6% of all land purchases coming directly from them.

In addition, affordability is a significant barrier to accessing land. An overwhelming majority of 94% of the respondents who do not have land said affordability is their problem with low income accounting for 58% and high cost of land accounting for 36%. This demonstrates that income and land cost are important determinants of access to land with income playing a more significant role.

The ranking of the methods of land acquisition for clients by the consultant agents is in Table 4. As with the results from the households' data, purchase from private landowners tops the list with allocation from local government taking the bottom.

Table 4: Ranking of methods of land acquisition for clients by consultants

Method	Rank
Direct State Government allocation	3
Direct Local Government allocation	4
Purchase from private landowners	1
Purchase from family/community land	2

Source: Authors' field survey, 2017

Constraints to Access to Land

Table 5 contains the mean rating and ranking of the constraints to access to residential land from the households' dataset. The results show that the households agreed on the average that three land accessibility elements, namely, affordability, ease of transaction and security of tenure are constraints to accessing land. Affordability is the most significant constraint. Similarly, the households agreed that nine of the thirteen variables that measured access to land are constraints. They were neutral on the rest four. General high cost of land ranked top as a constraint, followed by high cost of land relative to income of households, both variables of affordability. Difficulty in the process of registering title ranked third with a mean of 3.76. The least important variable is scarcity of residential land which ranked bottom with a rating of 2.98.

Table 5: Mean rating and ranking of constraints to access to land (Households)

Element/Variables	N	Mean	Remark	Rank
The following factors were constraints to me from getting a plot of land when I wanted to get one				
Affordability		***4.04***	***Agreed***	
General high cost of residential land	450	4.06	Agreed	1
High cost of residential land compared to my income	450	4.02	Agreed	2
Availability		***3.43***	***Neutral***	
Scarcity of residential land	450	2.98	Neutral	13
Scarcity of serviced residential land	450	3.49	Neutral	10
Lack of access roads to plots	450	3.57	Agreed	8
Lack of basic amenities in residential layouts	450	3.69	Agreed	4
Security of tenure		***3.58***	***Agreed***	
Land not having certificate of occupancy	450	3.67	Agreed	6
Land not having any title documents	450	3.43	Neutral	12
Fear of eviction by the government	450	3.50	Agreed	9
Land disputes	450	3.68	Agreed	5
Incidence of fake land title documents	450	3.64	Agreed	7
Ease of transaction		***3.62***	***Agreed***	
Difficulty in the process of buying land	450	3.48	Neutral	11
Difficulty in the process of registering land title	450	3.76	Agreed	3

Source: Authors' field survey, 2017

Interestingly, at least one variable of each of the four elements is a constraint. Although the households did not agree that availability is a constraint, they agreed that two of its variables, lack of access roads to plots and lack of basic amenities are constraints. In other words, when availability is viewed in terms of these variables, it is a constraint. The absence of these amenities can make land unusable.

The results in Table 6 indicate that the consultants agreed that affordability and security of tenure pose constraint to accessing land. They were neutral on the rest two. As with the households' results, affordability is the most significant constraint. In addition, they agreed that eight of the variables that measured access to land are constraints. They disagreed as to two – scarcity of residential land and difficulty in the process of buying land. As with the households' results, the two variables of affordability ranked top. However, they ranked high cost of land relative to household income first as against general high cost of land by the households. Also, they rated scarcity of residential land lowest to rank it bottom, a result that is consistent with that of the households. Overall, the results compare with those of the households.

Table 6: Mean rating and ranking of constraints to access to land (Consultants)

Response items	N	Mean	Remark	Rank
From your experience in Minna residential land market, please indicate how much you agree with the following as constraints to households accessing residential land for home development in the town				
Affordability		***4.30***	***Agreed***	
General high cost of residential land	20	4.20	Agree	2
High costs of residential land relative to household income	20	4.40	Agree	1
Availability		***3.28***	***Neutral***	
Scarcity of residential land	20	2.35	Disagreed	13
Scarcity of serviced residential land	20	2.75	Neutral	11
Lack of access road to plots	20	4.00	Agreed	4
Lack of basic amenities in residential layouts	20	4.00	Agreed	4
Security of Tenure		***3.77***	***Agreed***	
Land not having C of O	20	4.00	Agreed	4
Land not having any title documents	20	3.95	Agreed	7
Fear of eviction by government	20	4.20	Agreed	2
Land dispute	20	3.10	Neutral	9
Incidence of fake land title documents	20	3.60	Agreed	8
Ease of transaction		***2.75***	***Neutral***	
Difficulty in the process of buying land	20	2.45	Disagreed	12
Difficulty in the process of registering land title	20	3.05	Neutral	10

Source: Field survey, 2017

Hypothesis test

Independent sample t-test with two-tailed decision criterion was performed on the data to compare the two sample means. The null hypothesis is that there is no difference between the households and the consultants on their perceptions as to the constraints to access to residential land. Using the 5% level of significance, the null hypothesis is rejected if $p < 0.05$ and the difference is considered significant. The results are contained in Table 7.

Table 7: Independent Sample T-test for Equality of means

	t-test for Equality of Means				
Constraints to access to land	T	Df	P value. (2-tailed)	Mean Difference	Std. Error Difference
Equal variances assumed	0.3350	24	0.741	0.0708	0.211

The results did not provide sufficient evidence against the null hypothesis ($p > 0.05$). We cannot therefore reject the null hypotheses. Accordingly, we infer that there is no difference between the perceptions of the households and the consultants as to the constraints to access to residential land in Minna.

DISCUSSION OF RESULTS

The findings on methods of land acquisition is congruent with Nwuba (2017). The findings suggest that the Land Use Act, 1978 is not effectively playing its role of making land readily available to Nigerians. The failure of the Act in this respect contributes to the major role that private landowners play in urban land markets and consequently, the high cost of urban land. The implication is that to improve access to urban residential land in Nigeria, a review of the Land Use Act is essential.

In addition, the finding that the principal means households acquire land is through purchase from private landowners is consistent with Owoeye and Adedeji (2015) and Babatunde et al. (2014). As private landowners control the markets, it should be expected that affordability will be a major constraint as land prices will respond to market forces. These private landowners which include indigenous land-owning families and individuals often attempt to limit land supplies to hike prices, thereby constraining access. Moreover, some of their activities and those of their local agents such as selling same plots to more than one person sometimes with fake title documents constitute threat to security of tenure and hinder access. The situation is exacerbated by the low performance of the government in making usable residential land available and in land titling and documentation. The implication is that the government needs to play a larger role in the land markets to ease access. Provision of serviced residential lands at subsidised prices to households and streamlined and affordable processes of land titling and registration will be important measures.

The results support Nwuba (2017) on affordability and high cost of land as the most important constraints but contradict the author on the role of security of tenure as constraint. The finding on the role of high cost of land and security of tenure support Chukwuemeka and Kalu (2016) and Oladehinde, et al (2017). Similarly, the finding on availability as the least important constraint is consistent with Gbadegesin et al, (2016). It can therefore be deduced that constraints to access to urban residential land manifest in various ways in land markets across the country. The implication is that a broad spectrum of measures is required to deal with the problems.

One significant result is the combined role of low income and high cost of land in preventing some households from accessing land. Even more significant is that low income which is not a land issue plays larger role. The finding is a demonstration that poverty and not just high cost of land is a major constraint to access to urban residential land in Nigeria. The finding suggests that to some households, no land is affordable unless it is free. The implication is that measures to expand access to urban residential land should go beyond the land markets to involve reforms in the labour markets. Measures that will enable wealth creation such as supporting the growth of small businesses and infrastructure development will be useful.

Another noteworthy result is the constraint posed by security of tenure and particularly by fear of eviction by the government. This fear is likely to have been built from previous

eviction activities of government. Moreover, the failure of the government in land titling and in providing efficient processes of documentation of land transactions contributes to constraining access as it provides impetus for local land owners and dealers to engage in unwholesome practices such as faking land titles. The findings suggest that the government needs to do more to provide security of tenure to land holders and protect land rights even from itself.

It is remarkable that landowners play significant role in the markets not only as sources of land supplies but also as direct vendors. It is also instructive that the local agents play much bigger role in the market than the formal professionals. The insignificant role of the estate surveyors and valuers to whom land agency is a major area of service is surprising. The findings suggest that the populace is not sufficiently aware of the services of the professionals, particularly estate surveyors and valuers and that the professional firms find it difficult to penetrate the market. Overall, the findings imply that room exists to expand the professionalisation of the land transactions in the markets.

The results demonstrate the existence of significant barriers in accessing urban residential land by households. The fact that the results of both samples revealed these barriers makes it an issue of significant concern that requires policy attention.

CONCLUSION

The methods of access to land and the constraints to access can have strong implications for housing and welfare of the urban population. The study investigated access to land for private home development by households in Minna, Niger State to ascertain the prevalent methods of access and the constraints to access. The results revealed that the most common method of access to land is purchase from private landowners. In addition, the constraints to access to land manifest in affordability, security of tenure and ease of transaction. Affordability measured by general high cost of land and high cost of land relative to household income is the most significant constraint to access to land. No significant difference exists between households and consultants on their perceptions on the constraints to access to land.

To considerably improve access to urban residential land, the government should make substantial investments in providing serviced residential layouts and make plots available at subsidised prices to households and provide access roads and other basic amenities to residential districts where households can acquire land to build. There is also the need to improve security of tenure through streamlined and low-cost land titling and registration.

The study has made significant contribution to the land market literature. It has provided valuable insight into the land market by analysing constraints to access using well-developed variables and integrating the views of two important stakeholders in the land market. One implication of the research is that it has the potential for framework for land market reforms.

A limitation of the study is that it is based on data from land markets in one city. Analysing data from markets in other cities may reveal different results. Future researches should consider investigating the ways to reform the land market to reduce constraints to access to urban land.

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COMPARISON OF THE PERFORMANCE OF MANUAL AND DIGITAL LAND INFORMATION SYSTEM IN KWARA STATE, NIGERIA

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The increase in urban population and the competing uses of land appear to have overstretched the efficiency of the manual system. To overcome the constraints associated with this system, a number of States in Nigeria have considered Digital land information management system (D-LIMS). Kwara state being one of the states however had adopted the digital system with the establishment of Kwara Geographical Information System (KWAGIS) since the year 2008 with the purpose of converting existing land related information into functional digital format. This paper examined the level of users' patronage and challenges of Kwara State Land Registry services with the manual and digital system of land information management. Close-ended questionnaire was administered on 400 landowners and 146 registered professionals in the built environment for the study. Data collected on the level of patronage and challenges were analyzed using descriptive statistics. The result revealed that the number of application received and granted for its various services after the introduction of digital system since 2008 shows an insignificant increase over the number of application received and granted before the introduction as a result of the operation of the registry which still involves the manual/analogue filling system despite the digitalization of the registry. The paper advised that there is the need for automation and introduction of database software development/advanced JavaScript frameworks which will not only capture data in digital format only as obtainable currently with the existing Kwara State digital land registry but also enhance service delivery and eradicate the manual filling system completely in terms of speedy access to information, time of completing a transaction, ease of payment, security of data.

Keywords: Digital, Land Information Management System (LIMS), Lands Registry, Software

INTRODUCTION

Land is the most valuable possession of mankind and is also an important asset of any country (Ndukwe and Vincent, 2013). The wealth of the nation and its economic development are dependent on the state of the land and its usage, therefore, it is apparent that any information concerning land is valuable. Up-to-date information on rights that subsist in land such as ownership, occupancy, lease, mortgage etc are created in lands registry, hence, ensures confident dealings in property and security of title. Successive governments have made several efforts to make land information accessible to people through the use of manual land information system.

In a developing country such as Nigeria, virtually all aspects of land administration in some of the states are done manually. Galadima (2006) stated categorically that the Department of Land Administration and Resettlement, Federal Capital Territory (FCT) was operating a manual system of land information management. These were plagued by numerous bottlenecks, cumbersome process, widespread forgeries, document laundering and racketeering of land. According to him, other problems of land administration include cases of multiple allocation, unattended applications, allocations from "parallel Ministry" mismatches in land use, encroachment, inefficient revenue generation and collection and as well as delays in perfecting transactions in land.

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One of the most interesting developments in recent years has been the increased adoption of spatial enabled applications to assist government to manage its information and processes using concepts and technologies: a process that has come to be known as spatially enabled government (Masser, Rajabifard and Williamson, 2008). The vision of this process is to establish enabling infrastructure that facilitates the provision of the place or location to all human activities, and government actions, decisions and policies (Holland, Rajabifard and Williamson, 2010; Masser *et al*., 2008). Realizing this vision is dependent on the development of appropriate mechanisms to facilitate the delivery of data and services. Among others; these mechanisms embody efficient management of geo-data/land information.

Geographic/Land Information System (GIS/LIS) is one of the spatial enabled applications that have evolved rapidly in recent years, and is becoming a standard tool for information management, storage and data interpretation in most developing countries (Hoffman, 1998, Goodchild, 2001). The primary function of this tool is to graphically display aggregate data managed by software application as maps with layers of information (Zeferino, Marcia and Inalda, 2012). However, its use for supporting decision-making is not only limited to combining the different datasets, but to efficiently access, retrieve and apply land data and indicators without substantial effort to rummage around map storages or visiting sources or, conducting many diverse queries, merging different data and bringing all the data into the same map view (Zeferino *et al.*, 2012). However, despite its benefits the implementation has been proved as complex for both technical and institutional reasons (Saugene and Sahay, 2011). Technically, the complexity is caused by difficulty in handling emerging problems, the ability to deal with the advanced JavaScript frameworks such as ArcGIS, AutoCAD, ArcView, OpenLayers, ExtJS and GEoExt and the conversion of geodata between coordinate systems and format. Institutionally, tensions arise from various sources including the need for consensus on standards and the inclusion of users in the standardization activities (Saugene and Sahay, 2011).

The adoption of GIS technology in the area of land management and administration is a challenge to developing countries such as Nigeria. The introduction aims at improving land administration system by fast-tracking the issuance of title documents – Certificate of Occupancy (C of O) and other transactions in lands such as assignments, mortgages, etc. and the process of title registration as well as improving access to land information (Egbenta, Ndukwu and Adisa, 2012). It is a transactional system which has been helpful for revenue generation and monitoring of land information operations.

Kwara state which was created in 1967 out of the former Northern Region with about 36,825 Square kilometers, little was known then about the influx of population that is currently being experienced. People seeking for accommodation and land for construction of building requires land, which hitherto necessitated the acquisition of land without title. Land title then was beclouded with delay due to bureaucratic process, corruption and relatively expensive. This calls for the creation of Kwara Geographic Information System (KWAGIS) department in 2008, a mobilized digital component established to cater for effective land administration and information management in Kwara state.

Land Registry Services

Land registries create and maintain precious resources on property rights. They also secure land tenure, facilitate land transactions and provide important land information that is needed for a successful land market transaction (Dale and McLaughlin, 1988; Zenenbergen, 2002). The poor understanding of the significance of land information as a bedrock for prosperous land market development is a major barrier for proper development of land registry in Africa. One way of developing the land registry is by making information available and more accessible to a potential user.

Land Information on ownership, parcel information, and transaction information that are created in the land registry are significant data on which transparent land market transactions and performance depends on for good governance. Land registries are in possession of land information that should be made available for decision and policy makers but are rarely communicated to potential users because of the way and manner in which this information are stored. Decision makers are often not aware of the importance of land registries information and tend to take their decisions on ad hoc basis.

The Land Registry performs many functions, all related to land and real estate. This includes the processing and granting of land titles, C of O and central depository for all land title related documents in a state including record of encumbrances, long term lease, assignments and transfers of interests in real property (Adeleke, 2014). Other services as opined by Akingbade (2012) rendered in Land Registry are granting of Statutory Right of Occupancy, title registration and regularization, recertification, legal searches, consents to alienate, computerization of critical modules for e-land administration etc.

(i) Granting of Statutory Right of Occupancy

The Land Use Act, 1978 stipulates that the occupation of land situated in an urban area must be granted with a statutory right of occupancy (R of O) which is witnessed with the issuance of Certificate of Occupancy (C of O). The power to grant R of O within an urban area in a state is vested in the governor of that state. The Lands registry of that state is responsible for the processing of such applications. The processing of statutory R of O includes the seeking of approval of the governor who holds land in trust for the people and is responsible for the allocation of land comprised within the state.

(ii) Title Regularization

This is an attempt to harmonize titles not issued by the governor and a return to statutory as well as ensuring proper land title security within the state. They include the so called customary letter of grant in an urban centre, illegal structures on government acquired areas etc. A judicial pronouncement has declared such titles in an urban center as illegal. Title regularization is a way of correcting the mistakes made in the past; hitherto, defective titles are now getting regularized with proper valid statutory rights and certificate of occupancy.

(iii) Recertification

This is the use of geo-ICT to authenticate all plots of land allocated within the state before the establishment of a digital information system and issuance of new C of O from a geo-database to ensure their correctness and protection from forgery. The process involves the withdrawal of all the old land title documents issued since the inception of the state and replacement with new ones that have more security features and are difficult to replicate illegally without been easily discovered.

(iv) Legal Searches

A legal search is a process whereby individuals and organizations or their representatives (for examples Lawyers, Land Surveyors and Estate Valuers) are allowed to ascertain the genuineness of landed properties before committing their resources into land transaction. The law enforcement agents can also conduct a search in the process of discharging their official responsibilities. The searches provide first hand and reliable information about the validity of any title document emanating from the land office. The information from the process includes name of land occupier, history, restrictions, responsibilities and encumbrances.

(v) Consents to Alienate

The Land Use Act of 1978 provides that the consent of the governor must be sought before alienation of R of O or any part by assignment, mortgage and transfer of possession, sublease and sub-division of a plot of land into two or more parts, e.g. on devolution of death of the occupier of land.

(vi) Computerization of critical modules for e-land administration

These are tasks that are crucial and facilitate the transition into e-land administration (e-LA). The tasks are computerized to different levels to aid the services listed above. Other tasks that are computerized for e-LA are street names and house numbers, revocation and reinstatement of R of O, and fiscal cadastre for billing and issuance of payment demand notice and property valuation.

Users' of Land Registry and Patronage

Ojo (2014) conducted a study on the Evaluation of End-Users' Satisfaction on Land Title Registration Process in Akure, Nigeria. The result of users' patronage with the registry shows that the end- users (professionals) are mostly Legal Practitioners followed by Land Surveyors, Architects, Estate Surveyors and Valuers and Town Planners. These

professionals majorly act as agents between their clients and the land registry. The result reflects the true patronage pattern observed in Akure land registry which has more lawyers' patronage than other allied professional. These users patronize the registry very often during the manual system of land registry but the service delivery has not been very effective and efficient in terms of procedures which is believed to be cumbersome, very slow and waste time, associated with high cost in any land transactions and the security of data which cannot be guaranteed (Ojo, 2014).

Users' expectation on land registry of some states that are still operating with the manual system of land transaction is that of digitalization which enables land transactions in an electronic form. The introduction of a digitalized land registry in Nigeria has moved land services close to the users, land records can be accessed remotely using internet technology and service points are accessible for citizens who live far from the registry (Lusugga, 2009). Despite the benefits associated with a digitalized land registry, Adekoya (2011) asserted that the introduction of this digital registry has not yielded any increase in patronage as a result of high cost of transaction involved with the digital system and low level of public sensitization by the government about the benefits of a digitalized land registry.

Constraints of Land Information System (LIS) in Land Management

Ukaejiofor (2010) opined that GIS in land administration will help in promoting the economic and social development aspects of Nigeria because Geographic Information System has advanced from a good-to-have to a necessity in the management of land records, but despite this, Akingbade (2012), Nuhu and Salau, (2012) identified some challenges facing GIS in Nigeria and this challenges include:

(i) GIS Awareness for Decision Making

The effective role of Geographic Information System in Land management for good decision making is yet to be known by policy makers and the general public because of lack of public enlightenment on the GIS. Lack of computer literacy amongst all staff members, the lack of knowledge concerning GIS, and an awareness of its positive contributions and the relative low level of education of many technical and administrative staff were identified as the bane of GIS/LIS in Malawi (Sliuzas, 1997).

(ii) Capture and Maintenance of Data Sets

For GIS to be put into use in land management data must be captured and maintained and this is one big problem facing Nigeria in Land management.

(iii) Resistance to Change of Tradition and Management

One of the major problems facing Nigerians is the ability to cope with change or incorporate change as being dynamic and as part of life. These are changes in terms of organizational strategies, business processes and the integration of GIS in Land Administration. GIS/LIS application is considered as a foreign idea imposed without due consideration of the peculiar problems/conditions in sub-Sahara Africa. Singh (1989) and Taylor (1991) are of the opinion that GIS structures, technologies and applications are products of the needs of the western countries. For instance, most typists, in the state and federal services till date, find it difficult to get themselves acquainted to the New Information Technology of the use of computers, now that the type writers are no more en-vogue.

(iv) Fear of Employees losing their Jobs

In Nigeria, people find it difficult accepting changes, especially as regards Information Technology for the fear of losing their jobs, for instance, most civil and public servants on the typist grade, see the introduction of Information Technology as a means of snatching their jobs off them and granting such jobs to the younger ones, instead of getting themselves acquainted with the new technology.

(v) Lack of proper funding

The design and developmental stage of GIS/LIS applications are very cost intensive, which some economies of the developing world can hardly provide. Dale (1999) states that a lot of attention has been focused on technology while funding of human and institutional framework have been underestimated.

(vi) Lack of Political Will

Governments of these countries have not summoned enough courage to tackle land administration problems through GIS/LIS. They considered other issues as more pressing; however, they forget the fact that, there is a correlation between good land administration system and improved Gross Domestic Product (GDP) of nations of the world (Miller, 1993).

(vii) Lack of Infrastructural Facilities

Mostly, climate of ubiquitous dust and electric power fluctuations and outages are identifies as major problems for the proper adoption of GIS/LIS by Desert Research Institute (DRI) of Egypt and Global Research Information Database (GRID) of Kenya (Hastings and Clark, 1991).

(viii) Lack of proper online Internet Connectivity

Land Related Information System (LRIS) was established by Lagos State Government in Nigeria to provide basic GIS functions and supports through the internet was found to be very impractical due to poor internet connection (Speer, 1997).

RESEARCH METHODOLOGY

Survey research design was applied which involved the administration of questionnaires to the target population so as to extract necessary information for the study using Ilorin, Kwara State as the case study. The data used for the study was derived from primary source by means of a structured questionnaire. Using Yamen (1967) as adopted by Umeokafor (2010) and Oyetunji (2014), $n = \frac{N}{1 + N(e)^2}$ ..... (1)

n = size of sample

N = size of population (number of houses)

e = acceptable error (the precision) taken as $\pm$0.05 in this study,

The research population consists of 216,233 residential properties/housing units of Ilorin city (both individual and family land owners) and 146 Professionals in the built environment that makes use of Kwara State Lands Registry. The sample size of professionals in the built environment was based on the number practicing professional on each of their respective professional body's websites which comprises of 8 Architects, 20 Estate surveyors and valuers, 25 land surveyors, 85 lawyers and 8 town planners operating in Ilorin. This population is considered sizable and a structured questionnaire was administered on them.

Frequency distribution was used mainly for presentation of socio-economic characteristics of professionals and land owners and also the level of patronage before and after the introduction of digital land information system in Kwara State Lands Registry while weighted mean score was used to analyze the opinion of the respondents in order to identify the constraints associated with the existing digital Land Information System in Kwara State Lands Registry. Here, factors were rated against a pre-defined scale which assists in assessing the significances of each factor as well as their rankings. The factors are ranked from 1st to last in descending order of their weighted means such that the factor with the highest weighted mean ranks 1st while the one with the lowest weighted mean ranks last. The 5–point likert scale was employed since it allows the respondents an option when they are not sure of their response with 5, 4, 3, 2 and 1 denoting "Strongly Agree", "Agree", "Not Sure", "Disagree" and "Strongly Disagree". Weighted Mean Score (WMS) is determined using equation (1) as adopted by Ojo (2014).

$$WMS = \frac{5n^5 + 4n^4 + 3n^3 + 2n^2 + n^1}{n^5 + n^4 + n^3 + n^2 + n^1} \quad \ldots\ldots\ldots\

RESULTS AND DISCUSSION

Level of patronage of land registry services before and after the introduction of digital Land Information System

The level of patronage of Kwara State lands registry services before and after the introduction of digital land information management system by the users were examined considering the number of application received and granted for various services in the land registry and the results was presented in Table 1 and 2.

Table 1: Number of application received before and after the introduction of digital land information management system.

	Before (Manual Period)					After (Digital Period)				
	2005	**2006**	**2007**	**2008**	**2009**	**2010**	**2011**	**2012**	**2013**	**2014**
Statutory Right of Occupancy	N/A	N/A	864	872	863	852	868	842	877	971
Re-certification	N/A	N/A	N/A	N/A	N/A	82	148	208	284	352
Legal Searches	N/A	N/A	N/A	N/A	149	141	95	220	251	263
Consents to Alienate	N/A	N/A	243	289	262	312	382	369	348	387

Note: N/A- Not Available
Source: Authors' Fieldwork, 2015.

Table 2: Number of application granted before and after the introduction of digital land information management system.

	Before (Manual Period)					After (Digital Period)				
	2005	**2006**	**2007**	**2008**	**2009**	**2010**	**2011**	**2012**	**2013**	**2014**
Statutory Right of Occupancy	N/A	N/A	458 (53.01)	488 (55.96)	462 (53.53)	448 (52.58)	454 (52.3)	412 (48.93)	468 (53.36)	535 (55.1)
Re-certification	N/A	N/A	N/A	N/A	N/A	51 (62.2)	83 (56.08)	128 (61.54)	147 (51.76)	190 (53.97)
Legal Searches	N/A	N/A	N/A	N/A	149 (100)	141 (100)	95 (100)	220 (100)	251 (100)	263 (100)
Consents to Alienate	N/A	N/A	243 (100)	288 (99.65)	256 (97.71)	308 (98.72)	378 (98.95)	362 (98.1)	348 (100)	387 (100)

*****Note: figures in brackets are percentages.
*****N/A- Not Available
Source: Author's Fieldwork, 2015.

Table 1 revealed that there is no corresponding increase in the level of patronage of the registry after the introduction of digital land information management system considering the fact that the number of application from the users of the registry received for its various services in table 1 and granted in table 2 only has a minute increase yearly even after the digital intervention and the increase not really consistent and significant e.g. Statutory Right of Occupancy application received and granted before and after digitization consecutively for 2007 to 2014; 864, 458 (53.01%), 872, 488 (55.96%), 863, 462 (53.53%), 852, 448 (52.58%), 868, 454 (52.3%), 842, 412 (48.93%), 877, 468 (53.36%) and 971, 535 (5.1%) and so for other services except for re-certification service in which the number of application received and granted increased every year after the digital intervention; 82,51 (62.2%), 148, 83 (56.08%), 208, 128 (61.54%), 284, 147 (51.76%) and 352, 190 (53.97%). This increase in the number of application received and granted for re-certification service could be as a result of the fulfillment of one of the major responsibilities of KWAGIS which is to replace old certificate of occupancy with a digital certificate of Statutory Right of Occupancy which has a unique security features that avoids counterfeiting or forgery. The number of applications received and granted for some of the services of the land registry before the digital intervention was not available and could not be found which could be as a result of lack of proper record keeping afforded by the manual filling system before digitization.

Constraints associated with the existing Digital Land Information System in the study area.

Table 3: Constraints associated with the existing Digital Land Information Management System

	Landowners (Direct Users')		Professionals		All Users'	
Constraints	**Mean Score**	**Rank**	**Mean Score**	**Rank**	**Mean Score**	**Rank**
Lack of proper on-line internet connectivity from any location	4.49	1st	4.82	1st	4.66	1st
Lack of proper funding	4.19	2nd	4.70	3rd	4.45	2nd
Lack of Infrastructural facilities	3.95	3rd	4.71	2nd	4.33	3rd
Technical Problem	3.78	4th	4.64	4th	4.21	4th
Problem of Capturing and maintenance of data sets	3.60	5th	3.57	8th	3.59	5th
Low Level of GIS awareness for decision making	3.15	6th	3.49	9th	3.32	8th
Lack of Political Will	2.75	7th	4.39	6th	3.57	6th
Resistance to change of tradition and management	2.55	8th	3.75	7th	3.15	9th
Fear of employees losing their jobs	2.38	9th	2.85	10th	2.62	10th
Lack of dedicated trained personnel	2.27	10th	4.43	5th	3.35	7th

Source: Author's Fieldwork, 2015.

Table 3 showed the mean scores and the rankings of the constraints associated with the existing Kwara State digital Land Information Management System based on the level of agreement by the users' (both landowners and professionals). The analysis revealed that "lack of proper on-line internet connectivity" ranked 1st as the major constraint associated with the existing digital land information system by landowners with a mean value of 4.49, "lack of proper funding" ranked 2nd with a mean value of 4.19 while "lack of infrastructural facilities ranked 3rd with a mean value of 3.95.

The analysis of the response of professionals also corroborates with the response of the landowners which revealed that "Lack of proper on-line internet connectivity" ranked 1st as the major constraint associated with the existing digital land information system with a mean value of 4.82, "lack of infrastructural facilities" ranked 2nd with a mean value of 4.71 while "lack of proper funding" ranked 3rd with a mean value of 4.70. This indicated that the internet access to the services of the registry anywhere in the world in terms of filling application, payment of cost involved in transaction with the registry and other activities is not available and the registry is also poorly funded by the government in providing necessary and required infrastructural and digital facilities in order for the registry to match the current trend of land registry digitization. Therefore, it can be concluded that lack of proper online internet connectivity, lack of funding and infrastructural facilities are the major constraint associated with the Kwara State digital land information system.

CONCLUSION

The findings on the level of patronage of Kwara State land registry revealed that the number of application received and granted for its various services after the introduction of digital land information system since 2008 shows an insignificant increase over the number of application received and granted before the introduction. This result could be explained from two main perspectives. Firstly, the operation of the registry still involves the analogue filling system despite the computerization of the registry. The second obvious reason could be the constraints associated with the existing digital system in the registry which does only the capturing of data in digital format, lack proper online internet connectivity, infrastructural facilities and funding. This observation is in line with the view of Adekoya (2011) that the major benefit derived from digital land registry is the security of title which is evident with the issuance of newly improved Certificate of Occupancy and Recertification of old Certificate of Occupancy with special unique features that guarantees security against counterfeiting and forgery.

The major similar constraints associated with the existing digital land information system in Kwara State land registry as revealed by users' (both landowners and professionals) are lack of proper online internet connectivity, lack of proper funding, lack of infrastructural facilities, technical problem, problem of capturing and maintenance of data set, lack of political will, lack of dedicated trained personnel and low level of GIS awareness.

Lack of proper online internet connectivity as one of the major constraints associated with the digital land registry as revealed by this study corroborates with the study of Speer (1997) about Land Related Information System (LRIS) which was established by Lagos State Government in Nigeria to provide basic GIS functions and supports through the internet was found to be very impractical due to lack of proper online internet connection. As noted by Lusugga (2009), the introduction of a digitalized land registry in Nigeria has moved land services close to the users, land records can be accessed remotely using internet technology, but the reverse was the case from the findings of this study due to lack of proper online internet connection from any location being the first constraint as identified by the respondents.

Being the second constraints as identified by the respondents, lack of proper funding had also been identified from this study as one of the major constraints which was also noted by Dale (1999) who stated that a lot of attention has been focused on technology while funding of human and institutional framework have been underestimated. The effective role of Geographic Information System in Land management for good decision making is yet to be known by policy makers and the general public because of lack of public enlightenment on the GIS (Sliuzas, 1997). Adekoya (2011) asserted that the introduction of this digital registry has not yielded any increase in patronage as a result of high cost of transaction involved with the digital system and low level of public sensitization by the government about the benefits of a digitalized land registry. These findings therefore corroborate the findings of this study which revealed low level of GIS awareness for decision making as one of the major constraints associated with Kwara State digital land registry. The technical problem and the complexity involved in handling advanced JavaScript frameworks such as ArcGIS, AutoCAD, ArcView, OpenLayers, ExtJS and GEoExt and the conversion of geodata between coordinate systems and format as noted by Saugene and Sahay (2011) also form one of the major constraints associated with the existing Kwara State digital land registry.

There is the need for automation and upgrade of database software development/advanced JavaScript frameworks such as ArcGIS, AutoCAD, ArcView, OpenLayers, ExtJS and GEoExt etc which will not only capture data in digital format only as obtainable currently with the existing Kwara State digital land registry but also enhance service delivery and eradicate the analogue/manual filling system completely. There should be adequate funding and huge investment by the government to meet the basic infrastructural facilities needed in the registry for efficient service delivery. Government should upgrade database software development and application of information communication technology (ICT) in order to make available internet access to the services of the registry anywhere in the world in terms of filling application, payment of cost involved in transaction with the registry and other activities. Adequate security measures that will protect users' information online should be put in place in order to avoid unauthorized/unwanted internet access such as hacking, forgery and other criminal acts.

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IMPACT OF PERI URBAN GROWTH ON AGRICULTURAL LAND IN MINNA SUBURB

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Urban growth is seen to present both opportunities and threat to agriculture land. It was on this basis that this work sets out to assess the effect urban growth has on agricultural land uses in the peri-urban area of Minna, Niger State. Both primary and secondary data were collected in order to effectively achieve this. Simple random sampling was adopted in drawing samples from the study population. Two sets of satellite imageries obtained were used; that is, the Enhance Thematic Mapper (ETM) 2006 and the Enhance Thematic Mapper (2016). Three (3) spatial growth dynamics (Built-up, Agricultural land, Vegetation) were evaluated within the study areas between 2006 and 2016. Results obtained revealed that development has encroached into agricultural land uses with resultants environmental and socio-economic impacts on farmers. Though farmers had to relocate to the fringe for agricultural practices to give space for other competitive uses; results revealed significant improvements in their economic wellbeing due to increase in value of farm produce. The study recommends policy actions on the part of development control agency to produce a workable land use policy so as to curtail conflicting land uses, controls the pattern of development and prevents continuous encroachment into agricultural land in order to ensure food security in the Nigerian cities.

Keywords: Agricultural land, Land use, Peri-urban, Urban Growth, Built up Area

INTRODUCTION

The increasing population of the urban dwellers and demand for urban land has resulted to outward expansion of cities, leading to changes in land use at the city regions. Most prime agricultural lands at the peri-urban regions are bought up for other competitive uses such as residential, commercial, recreational and institutional uses amongst others (Antrop, 2000; Gallant *et al*., 2004; Musa *et al*., 2013). This increasing demand for land uses at the peri-urban region may have effect on the productivity of land, land prices, maintenance of biological diversity, landscapes and commuting patterns (Houston, 2005).

Fasakin and Ogunmakin (2006) observed increasing competitions amongst various land uses in the peri-urban areas in Nigeria, resulting to volatility in land prices. This is base on the fact that many peri-urban areas are undergoing a form of gentrification based on promotion of lifestyle and good living and can compete favourably with some land within the city (Argent, 2002). These peri-urban areas also play significant roles in food production and provision for urban dwellers (Etim and Edet, 2009). However, the challenge is that most peri-urban lands lacks elements of physical planning and so, characterized by fast and unplanned physical growth and development (Amoateng *et al*., 2013).

Development and competitive land uses at the peri-urban areas presents both opportunities and threats. It is on this note that this study set out to assess the effect of urban growth on agricultural land uses in the peri-urban area of Minna, Niger State with the view to assessing its socio-economic and environmental impact on farmers and livelihoods.

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Morenikeji, et al., (2018). **IMPACT OF PERI URBAN GROWTH ON AGRICULTURAL LAND IN MINNA SUBURB.** Contemporary Issues and Sustainable Practices in the Built Environment. School of Environmental Technology Conference, SETIC, 2018

REVIEW OF LITERATURE

One of the major problems threatening cities and towns of the third world countries today is that of population explosion leading to uncontrolled urban growth. Musa *et al*., (2013) assessed the impact of expansion of Minna, along the Minna-Bida road on agricultural land. The result of the study revealed that the quantity of farm produce been evacuated from the communities to Minna has been on a steady decline owing to the selling of agricultural land by the natives. The result also confirmed that the development activities now taking place in the study areas are not guided by any policy guideline.

Morenikeji *et al*, (2015) studied the dynamics of land use in Minna using Remote Sensing and Geographic Information System application (1986-2011). Results revealed increasing growth rates in built-up areas over the study period (The rate of growth of built-up area between 1986, 1996, and 2011 are 0.81%, 2.93%, and 4.06% respectively). The study observed that urban expansion and increasing land use changes in Minna is a function of increase in population and recommends city wide infrastructure such as water, roads and drainages that will cater for the increasing population and demand for land use in the area.

Popoola *et al*, (2016) examined spatial development of peri-urban areas in Minna, Nigeria between 1986 and 2012. The study attributed spatial development of the peri-urban areas in Minna to the challenges confronting cities in the area of housing, infrastructure provision and unemployment. Results obtained from the study revealed vividly, the emerging role of peri-urban in city expansion. Proper planning of bare surfaces, investment in mass housing projects and preservation of agricultural land for easy integration of the peri-urban into the city fabrics were recommended for proper management of the peri urban land.

It is therefore necessary to examine the socio-economic and environmental impacts of the peri-urban development in order to establish its effects on the immediate environment and livelihood of the peri-urban dwellers.

METHODOLOGY

Since the study wants to assess the effect urban growth has on agricultural land use in the peri-urban area of Minna, Niger State. Simple random sampling technique was used for the selection of respondents for the study, both primary and secondary method of data collection were used for the study and the use of geospatial techniques in determining the growth trend of the study area. Two different years were considered for the study (2006 and 2016) and two satellite imageries were obtained for the aforementioned years that is, Thematic Mapper 2006 and Thematic Mapper 2016. All the imageries were gotten from the National Centre for Remote Sensing Jos.

Table 1: Feature Classes considered during image classification.

S/N	Classification	Description
1	Built-up area	Comprises all residential, commercial and industrial areas, village settlement and transportation routes which reveal evidence of development.
2	Disturbed vegetation	Vegetation affected by human activities and comprises of all agricultural land and other vegetation such as trees, shrubs, palms, mixed forest and herbs.
3	Undisturbed Vegetation	Comprises of land affected by minimal human activities of which the forest canopy is still maintained
4	Water body	This comprises of river, permanent open water, lakes, ponds, streams, canals and reservoirs.

RESULT AND DISCUSSION

Figure 1a and 1b shows the development of Gidan kwano axis in 2006; the red colour represents Built-up areas which covered 0.36km^2 (7.42%). Disturbed vegetation (Agricultural land) represented in yellow colour was 3.19km^2 (66.64%). Vegetation represented with green colour had a total area of 1.24km^2 (25.94%).

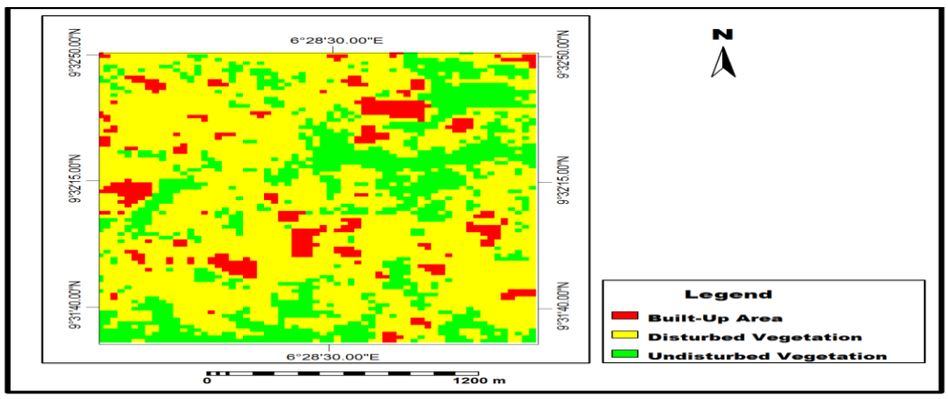

Figure 1a: Gidan kwano satellite image of 2006

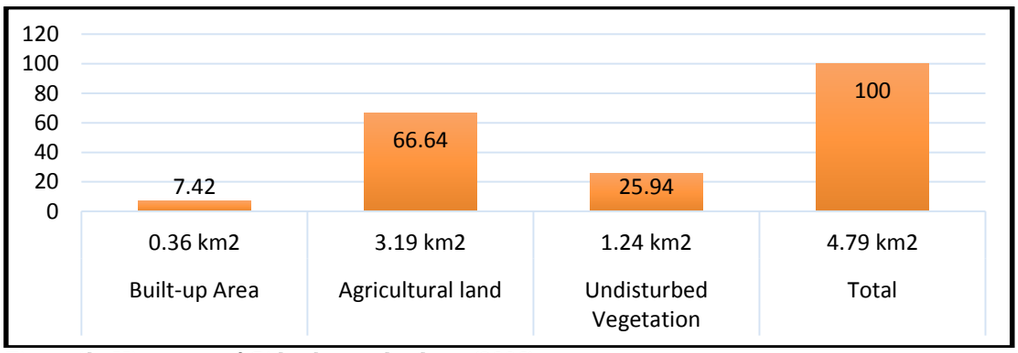

Figure 1b: Histogram of Gidan kwano land use (2006)

Figure 2a and 2b shows the image characteristics of Gidan kwano in 2016. Built-up area represented in red colour had grown to an area of 0.96km^2 (19.95%). Disturbed vegetation (Agricultural land) covers an area of 3.51km^2 (73.34%) and Vegetation represented in green had an area of 0.32km^2 (6.70%).

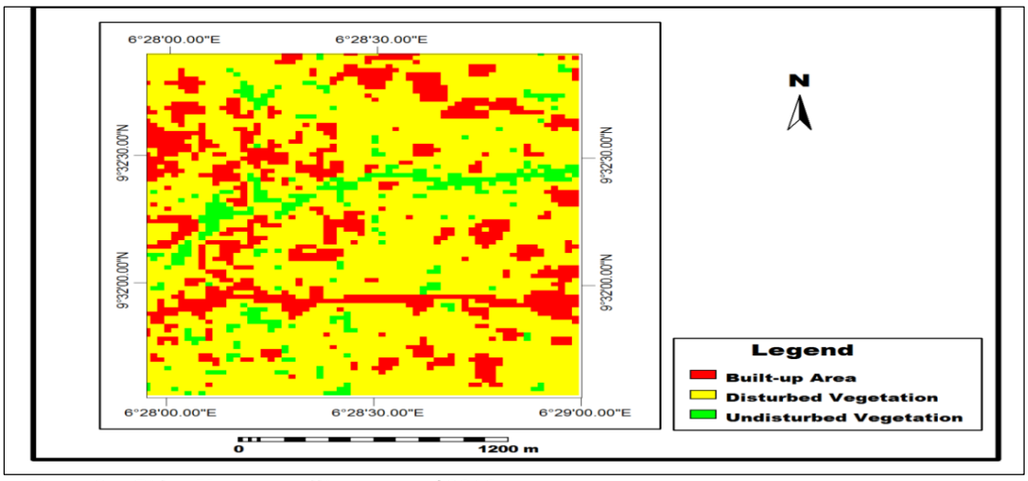

Figure 2a: Gidan Kwano satellite image of 2016

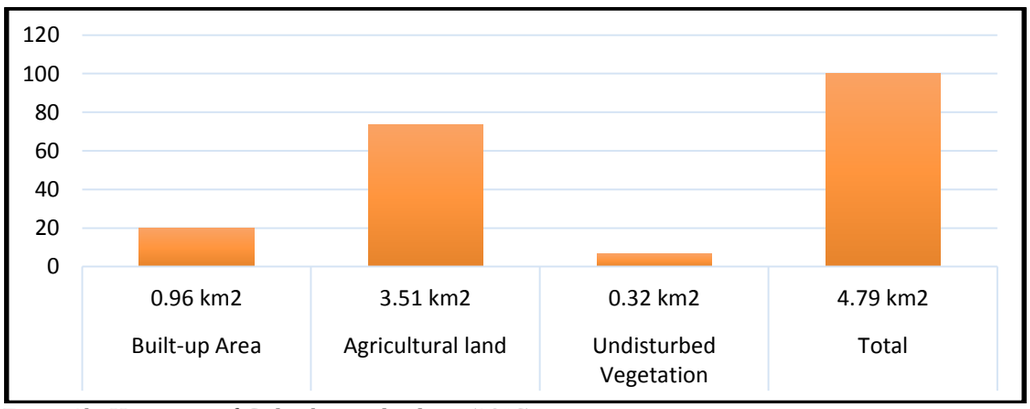

Figure 2b: Histogram of Gidan kwano land use (2016)

Figure 3a and 3b shows the area cover of Tudun Fulani in 2006; the red colour depicts built-up areas covering an area of 0.92km^2 (17.75%). Disturbed Vegetation (Agricultural land) in

yellow covers an area of 3.19km^2 (68.98%). Vegetation with an area of 0.76km^2 (13.30%) is represented in green.

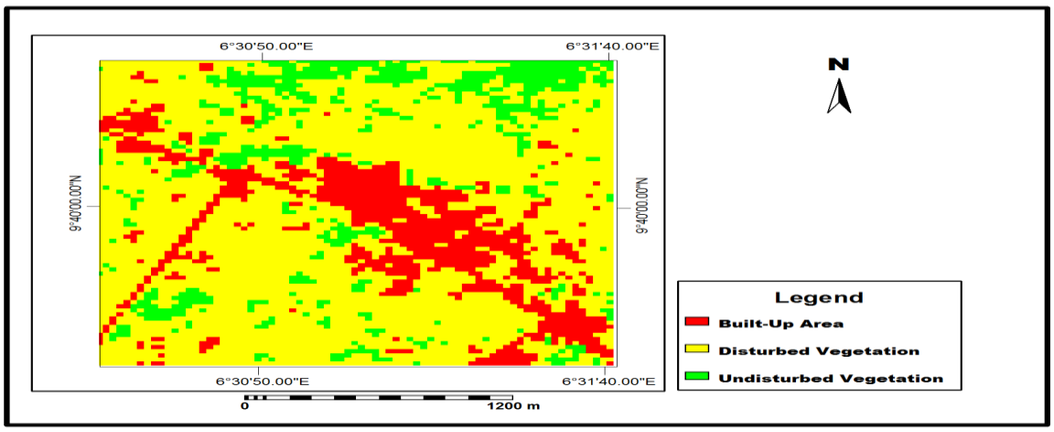

Figure 3a: Tudun Fulani satellite image of 2006

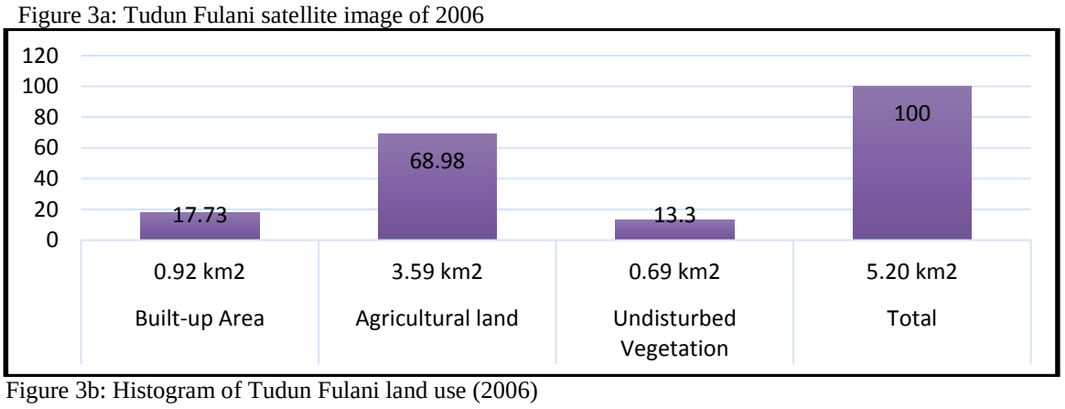

Figure 3b: Histogram of Tudun Fulani land use (2006)

Figure 4a and 4b shows the growth characteristics of Tudun Fulani in 2016. Built-up areas represented with red covers an area of 1.25km^2 (24.08%). Disturbed vegetation (Agricultural land) represented with yellow covers 3.19km^2 (61.39%). Vegetation covers 0.76km^2 (14.53%) is represented with green.

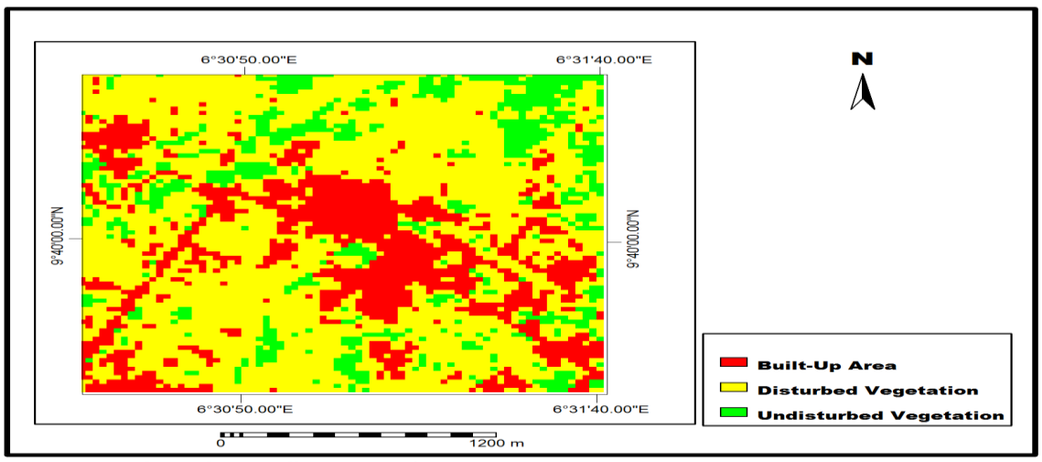

Figure 4a: Tudun Fulani satellite image of 2016

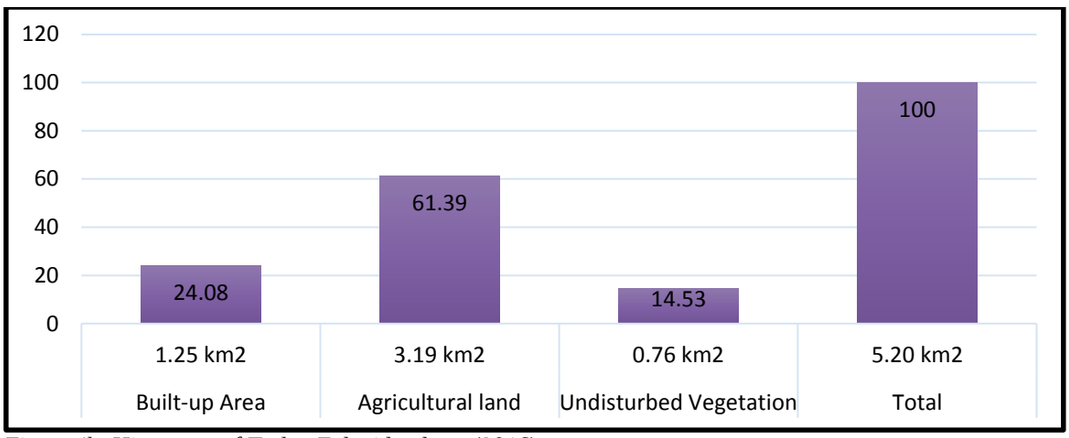

Figure 4b: Histogram of Tudun Fulani land use (2016)

Figure 5a and 5b shows the extent of Shango in 2006. Built-up area showed in red colour had an area of 1.32km^2 (8.65%). Disturbed vegetation (Agricultural land) covers an area of 11.81km^2 (77.71%) represented in yellow colour. Vegetation represented with green had an area of 1.94km^2 (12.76%) and Water body represented in blue covers an area of 0.13km^2 (0.88%).

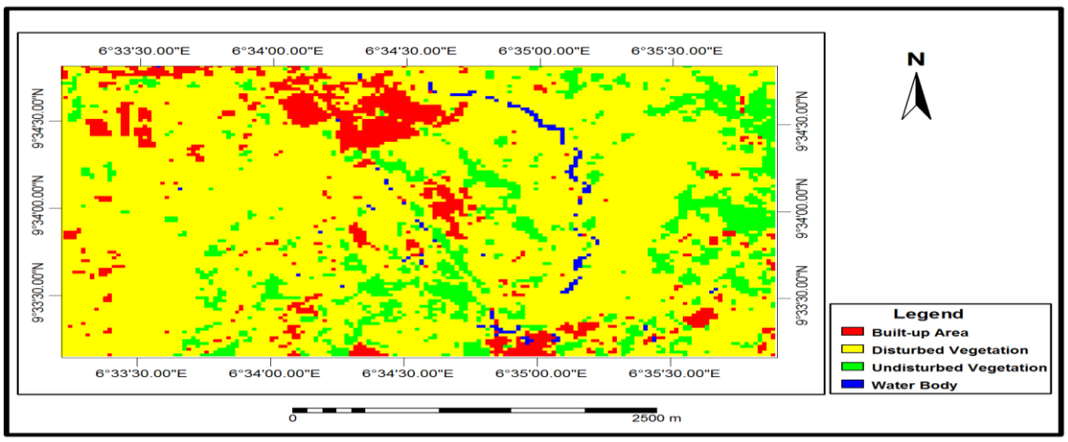

Figure 5a: Shango satellite image of 2006

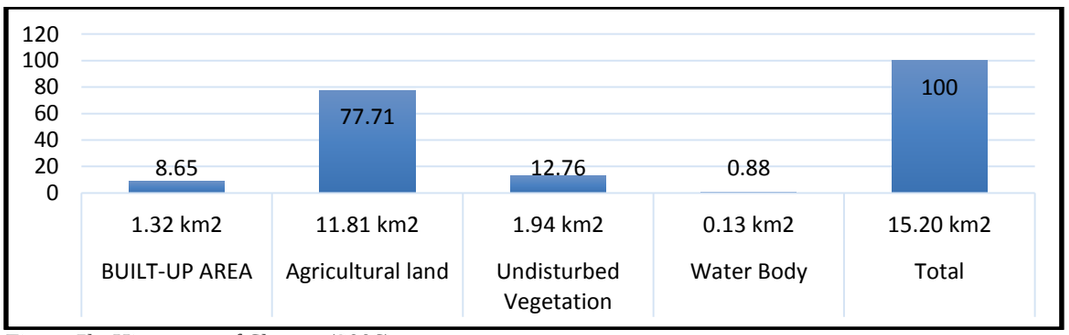

Figure 5b: Histogram of Shango (2006)

Figure 6a and 6b shows the growth of Shango in 2016. Built-up area represented in red colour occupied an area of 2.89km^2 (18.92%). Disturbed vegetation (Agricultural land) covers an area of 10.42km^2 (68.25%). Vegetation represented in green covered an area of 1.01km^2 (6.56%) and Water body represented in blue covered an area of 0.96`km^2 (6.27%).

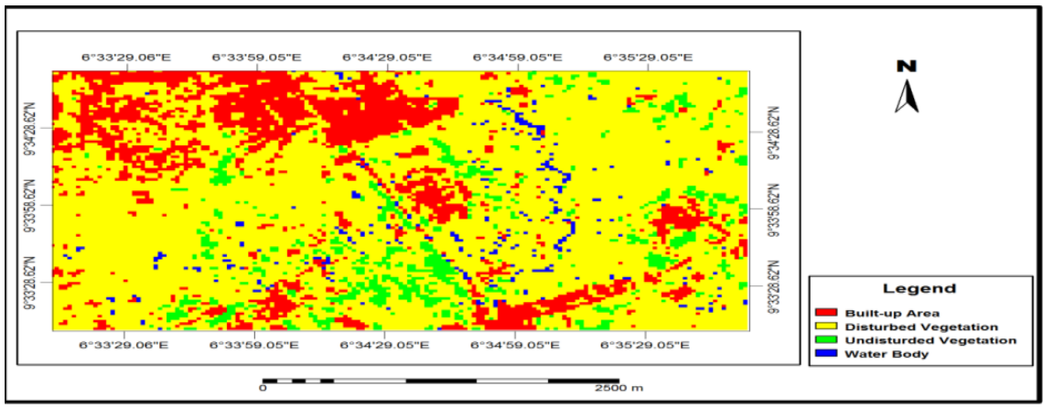

Figure 6a: Shango satellite image of 2016

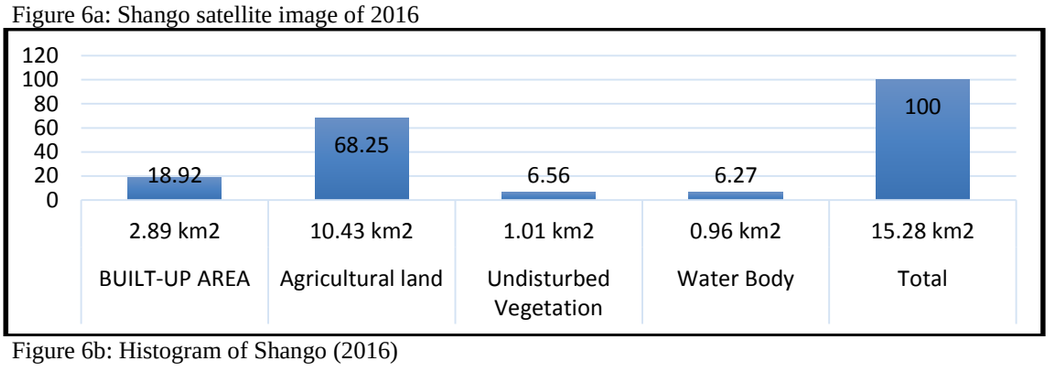

Figure 6b: Histogram of Shango (2016)

As shown in table 2, the magnitude of change in Gidan kwano between 2006 and 2016 was calculated by subtracting A from B (Land use in 2006 from 2016). The percentages of change (E) were calculated by dividing the magnitude of change of each land use by ten years (reference year) and multiply by 100. The table then revealed Built-up has been growing at 0.006km^2 yearly and Agricultural land growing at 0.0032km^2 yearly.

Table 2: Magnitude and percentage of change in land use (Gidan kwano 2006-2016)

CLASSES	A 2006	B 2016	C MAGNITUDE OF CHANGE (B – A)	D ANNUAL FREQUENCY OF CHANGE C/10	E PERCENTAGE OF CHANGE C/A * 1OO
Built-up	0.36	0.96	0.60	0.06	166.66
Agriculture Land	3.19	3.51	0.32	0.0032	10.13
Vegetation	1.24	0.32	-0.92	-0.092	-74.19
Total	4.79	4.79	0	-0.03	102.6

Source: Researchers Field work August, 2017

In table 3, the magnitude of change in Tudun Fulani between 2006 and 2016 was calculated by subtracting A from B (Land use in 2006 from 2016). The percentages of change (E) were calculated by dividing the magnitude of change of each land use by ten years (reference year) and multiply by 100. The table shows that Built-up has been growing at 0.033km^2 yearly and Agricultural land has been declining at 0.04km^2 yearly.

Table 3: Magnitude and percentage of change in land use (Tudun Fulani 2006-2016)

CLASSES	A 2006	B 2016	C MAGNITUDE OF CHANGE (B – A)	D ANNUAL FREQUENCY OF CHANGE C/10	E PERCENTAGE OF CHANGE C/A * 1OO
Built-up	0.92	1.25	0.33	0.033	35.87
Agriculture Land	3.59	3.19	-0.40	-0.04	-11.14
Vegetation	0.69	0.76	0.07	0.007	10.14
Total	5.20	5.20	0	0	34.87

Source: Researchers Field work August 2017

In table 4, the magnitude of change in Shango between 2006 and 2016 was calculated by subtracting A from B (Land use in 2006 from 2016). The percentages of change (E) were calculated by dividing the magnitude of change of each land use by ten years (reference year) and multiply by 100. The table shows that Built-up has been growing at 0.157km^2 yearly and Agricultural land has been declining at 0.139km^2 yearly.

Table 4: Magnitude and percentage of change in land use (Shango 2006-2016)

CLASSES	A 2006	B 2016	C MAGNITUDE OF CHANGE (B – A)	D ANNUAL FREQUENCY OF CHANGE C/10	E PERCENTAGE OF CHANGE C/A * 1OO
Built-up	1.32	2.89	1.57	0.157	118.94
Agriculture Land	11.81	10.42	-1.39	-0.139	-11.77
Vegetation	1.94	1.01	-0.93	-0.093	-47.94
Water Body	0.13	0.96	0.83	0.083	638.46
Total	15.20	15.28	0.08	0.008	649.75

Source: Researchers Field work August 2017

Table 5 shows the summary of the opinion of Gidan Kwano respondents on the causes of urban growth in the neighbourhood; the respondents attributed the presence of the Federal University of Technology as the main cause of urban growth in the neighbourhood followed by improved infrastructure, affordable houses, availability of land for farming and presence of market respectively.

Table 5: Causes of urban growth in Gidan kwano

Causes of Urban growth	**SA**	**A**	**D**	**SD**	**TWR**	**Mean**	**RII**	**Rank**
1. Presence of the University	57	6	0	0	246	3.90	0.98	1st
2. Improved Infrastructure	11	52	0	0	200	3.17	0.79	2nd
3. Affordable houses	6	48	9	0	186	2.95	0.74	3rd
4. Availability of land for farming	2	27	29	5	152	2.41	0.60	4th
5. Presence of Market	0	4	57	2	128	2.03	0.51	5th

Source: Researchers Field work August 2017

Table 6 shows the causes of urban growth in Tudun Fulani, the respondents agreed that presence of good road was the main causes of urban growth in the neighbourhood, availability of land for farming, improved infrastructure, affordable houses and presence of market assume the second, third, fourth and fifth positions respectively.

Table 6: Causes of urban growth in Tudun Fulani

Causes of Urban growth	**SA**	**A**	**D**	**SD**	**TWR**	**Mean**	**RII**	**Rank**
1. Presence of Road Network	18	40	1	1	194	3.29	0.82	1st
2. Availability of land for farming	19	33	6	1	188	3.19	0.80	2nd
3. Improved Infrastructure	10	49	0	0	187	3.17	0.79	3rd
4. Affordable houses	13	40	3	3	181	3.11	0.77	4th
5. Presence of Market	2	2	45	10	114	1.93	0.48	5th

Source: Researchers Field work August 2017

Table 7 illustrates the opinion of respondents in Shango as to the causes of urban growth in the neighborhood; the respondents believed that the presence of the College of Education

Minna was the main cause of urban growth and this was followed by Affordable houses, presence of market, improved infrastructure and availability of land for farming come last.

Table 7: Shango causes of urban growth

Causes of Urban growth	SA	A	D	SD	TWR	Mean	RII	Rank
1.Presence of COE Minna	68	8	0	0	297	3.91	0.98	1st
2. Affordable houses	7	64	5	0	230	3.03	0.76	2nd
3. Presence of Market	3	30	35	8	180	2.37	0.59	3rd
4. Improved Infrastructure	2	12	50	12	156	2.05	0.51	4th
5. Availability of land for farming	6	7	39	24	147	1.93	0.48	5th

Source: Researchers Field work August 2017

Table 8 shows the impact of urban growth on the farmer's activities as well as the environment of Gidan kwano. The farmer's perceptions were ranked in order of magnitude and the factor that most likely affect them. The farmers opined that the increase in prices of farm yields due to urban growth was the most prevailing circumstance, followed by relocation due to urban growth, hindrance in accessibility, reduced number of farmers and reduced crop yield came last.

Table 8: Socio-economic and Environmental Impact of Gidan Kwano

Socio-economic and Environmental Impact	SA	A	D	SD	TWR	Mean	RII	Rank
1. Urban growth has led to increase in prices of farm yield	22	39	0	2	207	3.31	0.80	1st
2. Urban growth have caused relocation	5	53	5	0	189	3.00	0.75	2nd
3. Urban growth has hindered accessibility to farmland	13	22	24	4	170	2.70	0.67	3rd
4. Urban growth have reduced the number of Farmers	4	20	32	7	147	2.33	0.58	4th
5. Has the number of crop yield reduced	1	4	51	7	125	1.98	0.50	5th

Source: Researcher's Field work August 2017

Table 9 show the views of Tudun-Fulani farmers as to the impact urban growth had on them as well as their environment. The factors were ranked as to which affect them mostly. Increased prices of farm yields came first, followed by accessibility problem, relocation due to urban growth, reduced crop yield and reduced number of farmers came last.

Table 9: Socio-economic and Environmental Impact of Tudun Fulani

Socio-economic and Environmental Impact	SA	A	D	SD	TWR	Mean	RII	Rank
1. Urban growth has led to increase in prices of farm yield	25	34	0	0	202	3.42	0.92	1st
2. Urban growth has hindered accessibility to farmland	22	29	7	1	190	3.22	0.81	2nd
3. Urban growth have caused relocation	13	44	1	1	187	3.21	0.79	3rd
4. Has the number of crop yield reduced	7	2	33	17	117	1.98	0.50	4th
5. Urban growth have reduced the number of Farmers	3	7	22	27	104	1.76	0.44	5th

Source: Researcher's Field work August 2017

Table 10 shows the impact urban growth has on the farmers as well as the environment of Shango. The farmer's opinions were ranked in order of magnitude and the factor that most likely affect them came first. The farmers were of the opinion that urban growth has seriously hindered accessibility, followed by increased prices of farm yield, reduced number of farmers, relocation and reduced crop yield came last.

Table 10: Socio-economic and Environmental Impact of Shango.

Socio-economic and Environmental Impact	SA	A	D	SD	TWR	Mean	RII	Rank
1. Urban growth has hindered accessibility to farmland	73	2	1	0	300	3.95	0.99	1st
2. Urban growth has led to increase in prices of farm yield	46	30	0	0	274	3.61	0.90	2nd
3. Urban growth have reduced the number of Farmers	2	36	30	8	184	2.42	0.61	3rd
4. Urban growth have caused relocation	7	68	1	0	234	3.12	0.77	4th
5. Has the number of crop yield reduced	2	0	62	12	144	1.89	0.47	5th

Source: Researcher's Field work August 2017.

Figure 7 shows the overlay of extents and the direction of growth and it reveal that there would be further encroachment into agricultural land in the future thereby depriving farmers of cultivable land. It further shows that the neighbourhood is growing towards the south-east region of the study area.

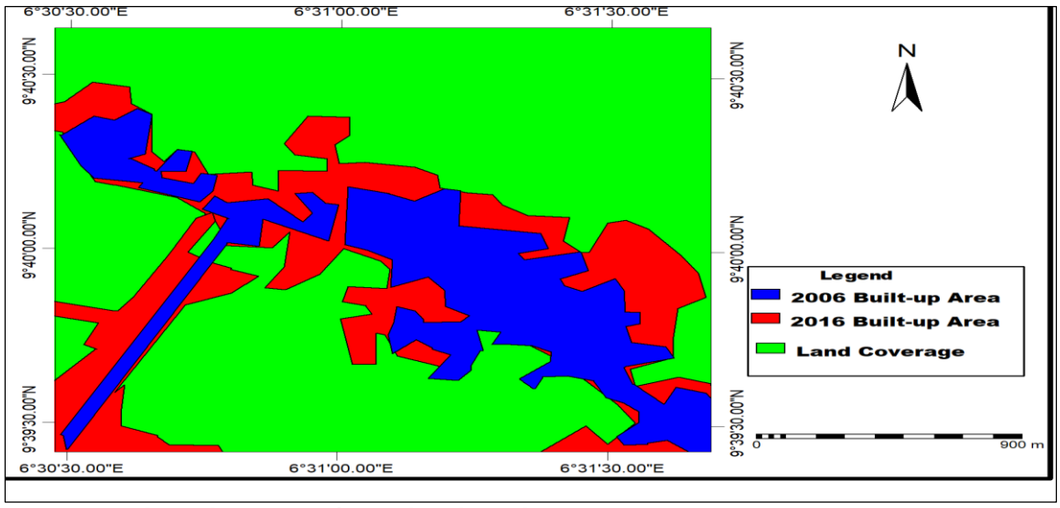

Figure 7: Overlay and Direction of Growth in the study area

SUMMARY OF FINDINGS

Research findings revealed that Built-up areas in Gidan-Kwano has been growing at 0.006km^2 yearly and Agricultural land also growing slowly at 0.0032km^2 yearly. In Tundun Fulani and Shango, Built-up has been growing at 0.033km^2 and 0.157km^2 yearly while Agricultural land declining at 0.04km^2 and 0.139km^2 yearly respectively. Summary of the opinion of Gidan Kwano respondents on the causes of urban growth in the neighborhood attributed the growth to the presence of the Federal University of Technology as the main cause of urban growth in the neighborhood followed by improved infrastructure, affordable houses, availability of land for farming and presence of market respectively. Similarly, the causes of urban growth in Tudun Fulani was attributed by the respondents to the presence of good road, availability of land for farming, improved infrastructure, affordable houses and presence of market, and in Shango the causes of urban growth in the was also attributed to the presence of the College of Education Minna followed by the Affordable houses, presence of market, improved infrastructure and availability of land for farming.

On the impact of urban growth on the farmer's activities as well as the environment, in Gidan kwano. Tundu-Fulani and Shango, the farmers affirmed that there has been increase in prices of farm yields due to urban growth taking over the available land for farming and most of the farmers have relocated inwardly due to this growth they also reported hindrance in land accessibility and reduced crop yield. The study further revealed that there would be further encroachment into agricultural land in Minna in the future and this will further hinder farmers access to cultivable land, the reason for this is that the development is growing towards south where lands are available for farming. The implication of the findings to the study areas is that Minna is losing valuable lands available for farming gradually to building development which at the short run leads to increase in the price of farm produce and food insecurity at the long run.

CONCLUSION

This research study has assessed the effect urban growth has on agricultural land uses in Minna Peri-urban and it concluded that the increase in houses and population has made agricultural activities move towards the fringe. The result of the study shows that the positive effect urban growth has on agricultural land uses overweighs its negative effects. The result shows that upon the growth experienced in the neighbourhoods, there is no decline in the economic wellbeing of the inhabitants of the study area and this shows that urban growth is not to be seen in a bad light.

RECOMMENDATION

The study recommends that there is urgent need for the Niger State Urban Development Board to take possible actions relating to urban land use so as to curtail conflicting land uses, the Niger State Urban Development Board should ensure it monitors and controls the pattern of development so as to reduce encroachment into agricultural land. There is need for the upgrading of Minna master plan and it should be strictly adhered to, and also land owners should be enlightened against selling of Agricultural land.

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DISASTERS, RESILIENT CITIES AND BUSINESS CONTINUITY

POST-RESETTLEMENT CHANGES AND ADJUSTMENT: A CASE STUDY OF SABON WUSE IN NIGER STATE, NIGERIA

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This study examined the various socio-economic activities and adjustment to changes resulting from the resettlement programme in Sabon Wuse Settlement of Tafa Local Government Area of Niger State. In order to achieve this aim, the socio-economic activities, the sources of livelihoods and the level of satisfaction with the public utilities and services were assessed. In all, a total of 268 questionnaires were administered to household heads through a systematic sampling technique and frequencies and percentages were used for descriptive statistical results. Findings show that there is a relatively adjustments to the new settlement, as there has been a relative increase in the income level of household heads, 47.8% of the respondents now earn between N25,001.00 to N35,000.00 while 17.9% of the respondents now earn more than N35,000.00. 49.3% of the respondents are engaged in secondary economic activities compared to their previous forms of occupations (agriculture and cattle rearing). The utilities and services provided in the study area were adequate to a as 29% of the total respondents travel less than 500 metres to access to water supply. The healthcare services has also improved as revealed by the survey, before the resettlement, 39.1% of the respondents travel a distance of 1,501 – 2,000 metres in order to get healthcare services but after the resettlement only 22.8% of the respondents travel the same distance to get healthcare services. It is recommended that measures should be put in place to control the rate of physical development and as the settlement experiences growth, there is need for improvements on public utilities and services such as roads, water supply, electricity, schools, etc. on incremental basis.

Key words: Adjustment, Post-settlement, Livelihood, Household,

INTRODUCTION

Movement of people can either be forced or voluntary. Disasters, such as wars, floods and earthquakes, among others, are some of the reasons that could force man to move out of an area that he is familiar with, to resettle in an entirely new area. Government acquisition of land for development projects is another cause. All over the world resettlement programmes bound. Nigeria is no exception to these phenomena. Most programmes involve Government decisions, which leave the affected people with very little room to manoeuvre (Jibril, 1990).

Resettlement schemes are embarked upon so as to improve the well-being of the affected people. However there is no resettlement scheme that is void of several problems which may range from social, to economic, political or administrative. In some cases, the experience can be traumatic. An important factor to be considered when conceptualizing a resettlement scheme is that of social and cultural integration. Another important factor is the economic life of the people of the people resettled as well as their access to farm-lands and other rural resources that they were used to prior to the wholesome change in location (Tijani, 2003). Other types of policies can also induce resettlement. For example, a distributive policy decision that shifts jobs between two regions might cause some people to move in search of new employment. Around the world and particularly in Africa, examples abound where whole communities are forced to move as a result of development.

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For example, the building of Kariba Dam across the Zambezi River in Zambia caused the resettlement of the Tonga people from the Gwembe valley and the inundation of River Niger at Jebba in Nigeria led to the evacuation of about 6000 rural dwellers and their subsequent resettlement into a new environment. Despite the fact that resettlement was used as a tool for rural development through provision of some social amenities, the resettled people had to battle with adjustment to rural change. Issues of resettlement have therefore been raging up to the current times. (Olawepo, 1999).

In Nigeria, Rural Development and Resettlements Schemes can be described in line with the rehabilitated spontaneous efforts but with a difference (George, 1999). Resettlement Schemes are government initiated schemes for the disadvantaged social groups. For example; the purpose of the Shendam Resettlement Scheme which had 8,500 settlers, was initiated to control the downhill movement of peasant farmers from Jos Plateau into the fertile but virtually unhabited plains lying between the Shemankar and Wase Rivers. It was also to improve the material welfare of peasant farmers by teaching them better farming methods and by introducing cash crops, and provision of social facilities. This scheme could be said to have been successful.

Various studies on the above criteria and other resettlement issues revealed that the bulk of analyses of resettlement schemes are post evaluative studies, measuring the success or failure of such schemes. Others viewed resettlement and planned settlement schemes as means of improving living standards, especially when innovative changes are involved. The components of resettlement changes brought about by relocation of settlement vary from one location to another, especially when resettlement involves spatial relocation of villages.

Whatever factors that might lead to displacement of persons, by political or geographical factors, by disease or otherwise, executing resettlement schemes in whatever scope requires maximum attention, given the amount of stress that goes with it, as well as the result of such movement. It is therefore necessary to consider whether or not the movement of scattered settlements to completely different environment will provide better opportunities in the area of socio-cultural, economic and physical needs (Olawepo, 2010).

Resettlement activities can lead to displacement of persons, and displacement in our context refers to both ‘physical displacement’ and ‘livelihood’ displacement (or deprivation). However, within the literature on displacement, again the focus is on displacements occasioned by development activities such as natural resource extraction, urban renewal or development programs, industrial parks, and infrastructure projects (such as highways, bridges, irrigation canals, and dams), which all require land, often in large quantity to be realized. Therefore, one common consequence of such projects is the upheaval and displacement of communities. The continuation of resettlement exercises all over the world is inevitable. Rather than condemning the process, it is better to look upon ways of bringing development into it. This could only be achieved by seeking to find salient features of socio-economic changes evolving from an existing scheme to reduce the effect of dislocation and deprivations (Oloba, 2004).

This study aims at examining the post resettlement changes and adjustment resulting from resettlement in SabonWuse in Niger State. The specific objectives include: assessment of the impacts of the relocation on the socio-economic life of the people, examination of the effects of the relocation on the sources of livelihoods and assessment of the residents' perception on the level of satisfaction of public utilities and services.

Conceptual Clarification and Literature Review

Resettlement is a theme that has been looked at from a variety of perspectives. From political, social or economic perspectives, all which may be right in their own perspectives. However, the issues of poverty and economic growth cut across all disciplines, hence the need to study this subject in a multi-disciplinary environment. Roder(1991) define resettlement from a social perspective. However there is a general agreement in the literature that resettlement takes mainly two forms, voluntary resettlement, where people volunteer to move to different areas normally in pursuant of a better life or involuntary resettlement where people are forced to move due to a development project, reform policy. Concisely it involves the movement of people from one area to another either voluntarily or by coercion.

A related issue to land resettlement which complicates the problem is on whether we should be looking at the question of land resettlement or land reforms? Keith (2001) argues that in the 1970s and 1980s, land resettlement was more fashionable amongst the international

community but many of these schemes have failed. Keith (2001) further argues that leasehold enfranchisement as used in land reform is different from land resettlement. To start with leasehold enfranchisement simply involves the empowering of citizens in ensuring that their rights on land are clear and secure while land resettlement involves the purchasing of large tracks of land subdividing and allocating to new settlers, which requires huge expenses. Keith (2001) then outlines the reasons for failure of most of these resettlement schemes, which include:

1. High costs of land acquisition.
2. Inability of the land administrative machinery to cope with the scope of work.
3. Lack of support and training to the beneficiaries in the schemes.
4. Lack of dedication to farming by most beneficiaries, who normally just want land for residential purposes.

Keith (2001) also observes that resettlement programmes have predominantly focused on the process of physical relocation rather than on the economic and social development of the displaced and other negatively affected people. This has severely eroded the development effectiveness of resettlement and rehabilitation programmes and heightened the impoverishment risk of the resettlers. According to Cernea (1998) risks to adversely affected people are not a component of conventional project analysis. The key economic risks to affected people are from the loss of livelihood and income sources such as arable land, common property resources such as forests, grazing land, ground and surface water, fisheries, etc and changed access to and control of productive resources. The loss of economic power with the breakdown of complex livelihood systems results in temporary or permanent, often irreversible, decline in living standards leading to marginalization. Higher risks and uncertainties are introduced when diversified livelihood sources are lost. Loss of livelihood and disruption of agricultural activity can adversely affect household food security, leading to under-nourishment. Higher incidence of diseases associated with deteriorating water quality can result in increased morbidity and mortality.

An Overview of Some Rural Resettlement Programmes in Nigeria

Resettlement programmes have been carried out in Nigeria as far back as the pre-independence era. However, major rural resettlement projects worth mentioning and discussing are those of the Kainji Lake basinand the Bakolori Dam Project.

The Kainji Lake Basin Project:

The damming of the River Niger at Kainji resulted in the resettlement of over 43,000 people at different points on the banks of the new lake. To carry out this exercise, the Niger dams Resettlement Authority was formed in 1962. Its first action was that of cash compensation, for the displaced people, and encouraged them to rebuild their homes at chosen sites out of the danger zone. The officers saddled with this responsibility were those long associated with the area. The project took off with resettlement and compensation of farmlands, economic trees and animals. However, in 1962 the compensation was later abandoned. The project later on followed the sinking of wells where water was found to be a problem as well as the introduction of agricultural extension workers (Tijani, 2003).

The starting point of the project was the resettlement and farmland compensation surveys which started in the late 1962. However, in 1964, the policy of cash compensation was abandoned. Among other actions taken were the sinking of wells where water was found to be a problem and the introduction of agricultural extension services. A programme of educating the people on the project was initiated right from the beginning to forestall rumours.

In 1964, the building compensation policy was introduced which states that “Government has decided that the compensation procedure be modified so that payments would be made in kind rather than in cash, and that as much as possible certain villages be regrouped together at sites where water supply will be more abundant. In order to avoid friction, it was agreed that in grouping the villages, village heads would retain their identity but amenities such as market, schools and wells would be shared in common wherever possible the resettlement authority will arrange for the building of the houses.” (Olawepo, 2010).

In the two policies, it was however noted that farmers who were compensated relaxed and did not go to look for new farms. Also the policy of regrouping villages only succeeded in grouping eight (8) villages into two before being abandoned, except where the village

expressed agreement to such grouping. By August 1968, the resettlement had been completed, with 41,654 people from 239 hamlets/villages/towns resettled in the 141 new ones. Yelwa town was partially resettled away at the base of the dam in New Bussa.

The implications of this project, especially as regards agriculture which was the backbone of their economy, was the disruption in their farming system, and the problems of accessing lands that were as fertile as where the ones they once lived. Some of the complaints by deserters was that of poor lands both for building and agriculture. On the whole, however, the project was successful from which some lessons could be learnt. (Oloba, 2004).

Study Area

Niger state is located between latitudes 8° 20 ' N and 11°30' N and longitude 3° 30'E and 7°20'E. The state is situated in the North Central geo-political zone and shares its borders with the Republic of Benin (West), Zamfara State (North), Kebbi (North-West), Kogi (South), Kwara (South-West), Kaduna (North-East) and the Federal Capital Territory FCT (South-East) (Niger State Government, 2004). Figure 1 shows the location of Niger state in Nigeria. The state covers a total land area of about 76,000sq.km, or about 9 per cent of Nigeria's total land area. This makes the state the largest in the country (Baba, 1993, Online Nigeria, 2003.). At inception in 1976, the state had only eight Local Government Areas (LGAs), however, with the series of state and local government creation exercises and boundary adjustments between 1979 and 1996; the number of LGAs in the state has increased to twenty-five. (Sulyman, 2014).

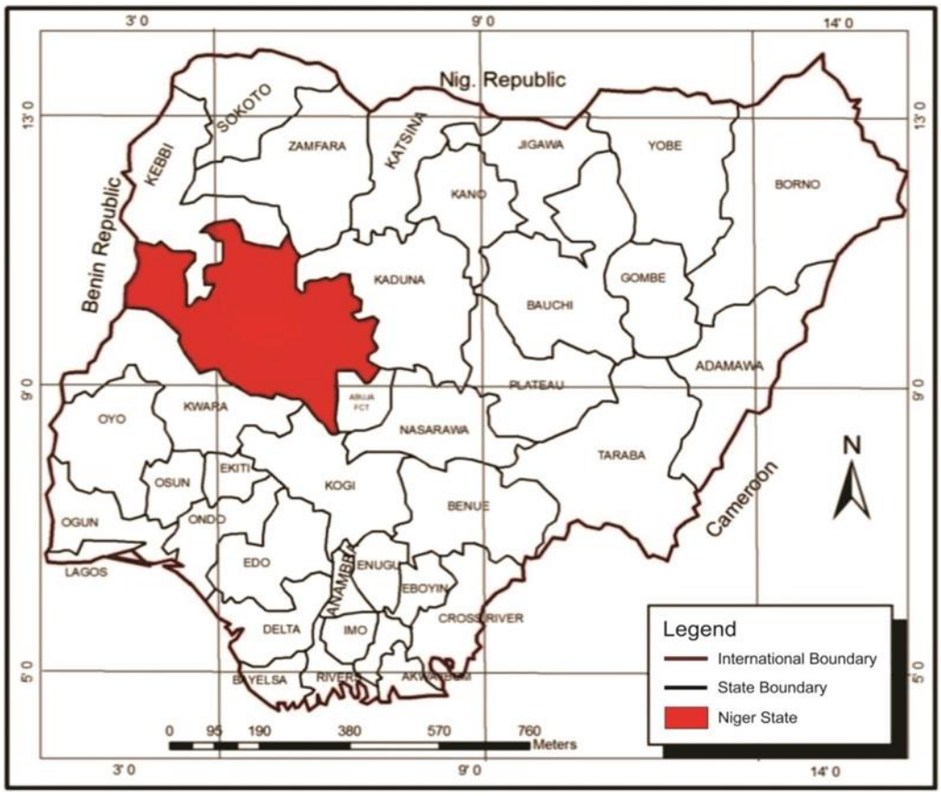

Figure 1.1: Niger State in National Setting
Source: Ministry of Land and Survey, Niger State.

Tafa is a Local Government Area in Niger State, Nigeria in which the study area is located. Tafa L.G.A. is located between on the coordinates; 9°15′N 7°15′E 9.250°N 7.250°E .
It adjoins the Federal Capital Territory (Abuja). Its Headquarters is in a new town of Wuse (SabonWuse). With a total land area of approximately 222 Km^2, and a population of about 83,544.In 1979 the Federal Government of Nigeria requested Suleja (then called Abuja) to concede its name to the new Federal Capital Territory (FCT) which is now called Abuja. These are monumental sacrifices towards peace, unity, progress and harmony in the area; this also brought a change which led to a new resettlement known today as New-Wuse, which was under the present Suleja Local Government as far back as the year 1980 (Sulyman, 2014).

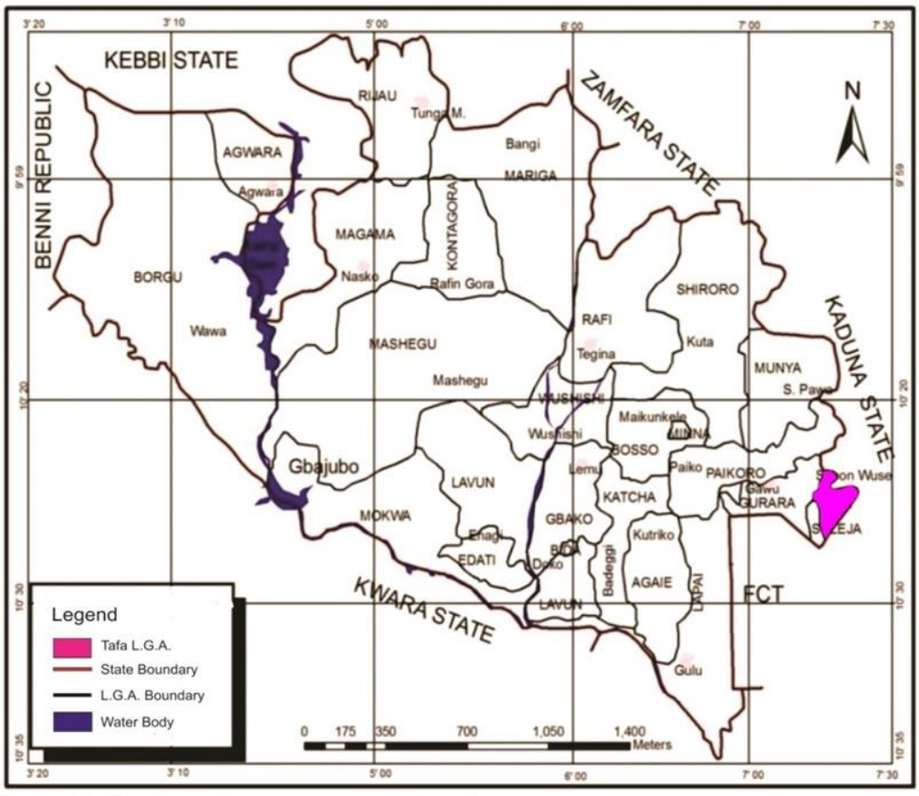

Figure 1.2: Tafa Local Government Area in State Setting.
Source: Ministry of Land and Survey, Niger State.

Historical Background

In 1975, during General Murtala Mohammed's regime, there was a need for a new Federal Capital Territory that is centralized geographically. Wuse settlement was located within central region of Nigeria and was incorporated into the Federal Capital Territory. This brought about the resettlement of natives of Wuse (gwandara). The resettlement scheme involved the construction of new buildings and facilities in the area recognized now as SabonWuse.

The name SabonWuse was an acronym for new Wuse because of the displaced people when the Federal Capital was established in 1976. It was created in 1977 during the resettlement scheme of Wuse natives.

RESEARCH METHODS

According to the 1991 national census exercise, SabonWuse had a population of 3,250. Thus the projected population to 2014 is 10,727. Using a household size of 8, the total number of households will be 1,341. Thus, 20% of 1,341 will be 268. Therefore 268 questionnaires were administered for data collection.

A systematic sampling technique was used in selecting the households for questionnaire administration. One household was first of all selected as a starting point and after which, an interval of 5 houses was used to determine other household to be given questionnaires. The questionnaire administration was directed to the household heads.

Primary data was gathered by means of personal observation, interviews and questionnaire administration. The questionnaire was designed to capture all information needed to buttress the objectives of this research work. Questionnaires were directed to household heads, in order to collect information on socio-economic characteristics of the households.

On the other hand secondary data was obtained from journals, textbooks, maps, internet and other relevant documents.

RESULTS AND DISCUSSIONS

Resettlement Changes in Housing and Infrastructure

Ownership of House.

The survey conducted on ownership of house reveals that 84.7% of the respondents were house owners before they moved to the new settlement. According to the survey conducted, the percentage difference between house owners before and after the resettlement is negligible. The difference however is that of housing quality and arrangement of individual dwelling units. The new settlement has a well-planned and developed layout on which the new houses are built.

Table 2. House Ownership Before and After Resettlement

House Ownership	Before Resettlement	After Resettlement
Yes	84.7	85.1
No	15.3	14.9
Total	**268**	**100**

Source: Field Survey, 2014.

Sources of Water Supply before and after Resettlement

The study also reveals that before resettlement, a high percentage of the population get their water from the well. They account for 60.1% of the respondents as shown in the chart below. After the resettlement however, a good fraction of the populace (45.9%) now get their water supply from the boreholes that have been provided.

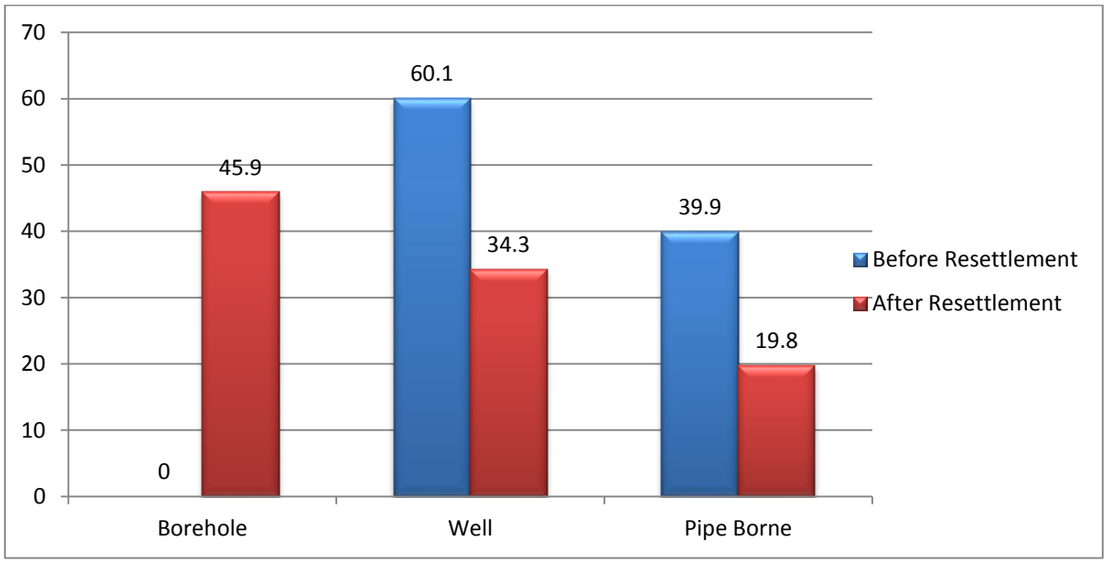

Figure 1.1: Sources of Water before and After Resettlement
Source: Authors Field Survey, 2014.

Proximity to Sources of Water before and After Resettlement

2% of the population cover the minimum distance of less than 500 metres to get water supply before the resettlement programme, while 29.0 of the population now travel a minimum distance of less than 500 metres to get access to water in the new settlement. This is a clear indication that water supply is considerably within the reach of the habitants.

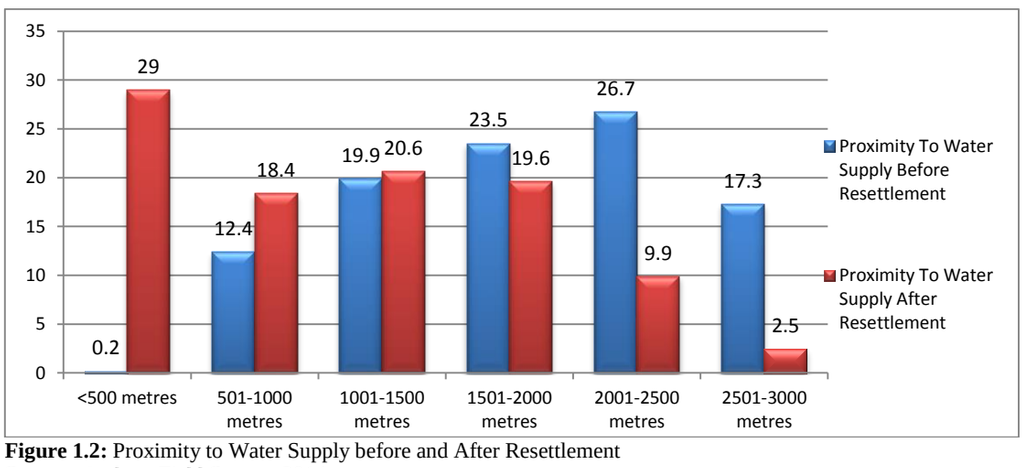

Figure 1.2: Proximity to Water Supply before and After Resettlement
Source: Authors Field Survey, 2014.

Provision of Health Services before and After Resettlement

In any planning scheme, the health and wellbeing of the affected people should not be treated lightly as this has a major influence on all other aspects of their lives. The siting of the Umaru Musa Yar'adua Memorial Hospital in the area gives a major boost to the provision of professional healthcare service. Only 22.8% of the respondents travel between 1501-2000 metres to access health services after the relocation exercise.

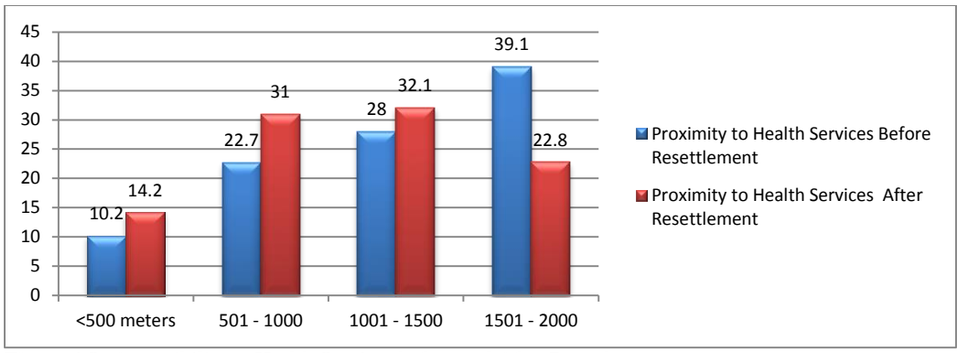

Figure 1.3: Accessibility to Health Services before and After Resettlement
Source: Authors Field Survey, 2014.

Provision of Educational Facilities before and After Resettlement

It has also been observed that only a small fraction (6.0%) of the population covered a minimum distance of below 500 metres to primary school in the old settlement, while 17.2% of the population now cover a minimum distance 500 metres to primary school. This shows that the provision and location of primary schools within the new settlement is more preferable than the old settlement.

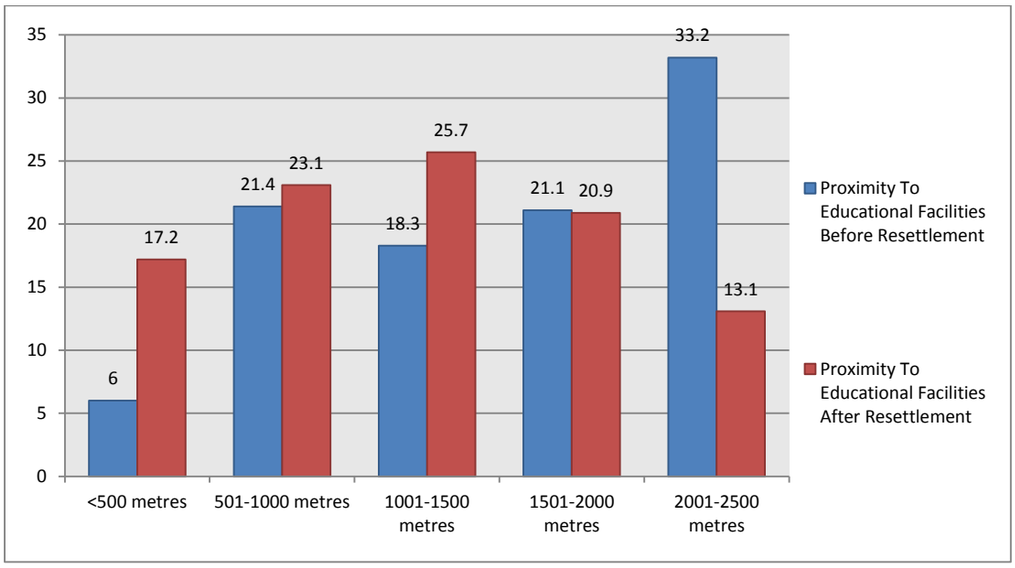

Figure 1.4: Accessibility to Primary Schools before and After Resettlement

Source: Authors Field Survey, 2014.

The survey also reveals that 6.4% of the population covered a minimum distance of below 500 metres to secondary school in the old settlement, while 16.0% of the population now cover a minimum distance 500 metres to secondary school. This shows that the provision and location of secondary schools within the new settlement is more preferable than the old settlement.

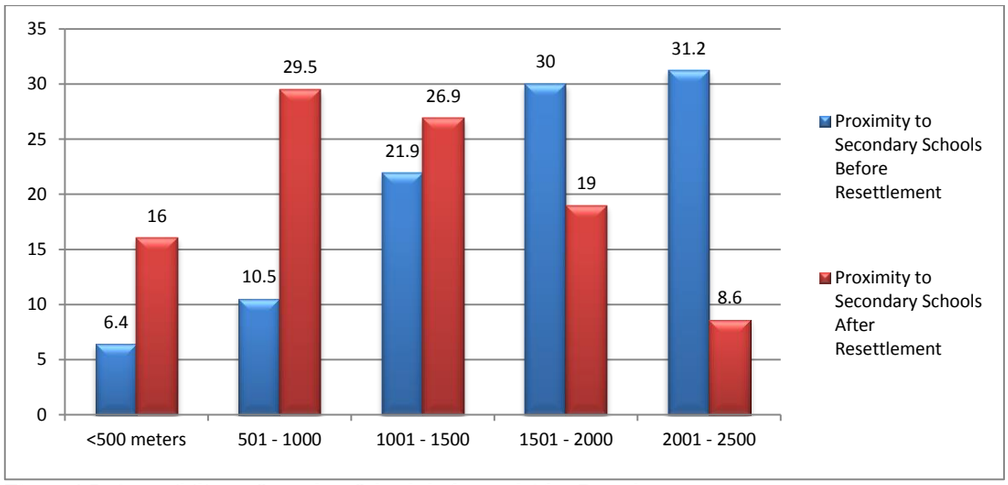

Figure 1.5: Accessibility to Secondary Schools before and After Resettlement
Source: Authors Field Survey, 2014.

Residents' Perception on Infrastructure

Level of Satisfaction with Roads

The survey conducted revealed that 29.9% of the respondents were not satisfied with the roads, due to incomplete road construction within the settlement. The graded roads are being eroded and gradually developing pot holes on the surface.

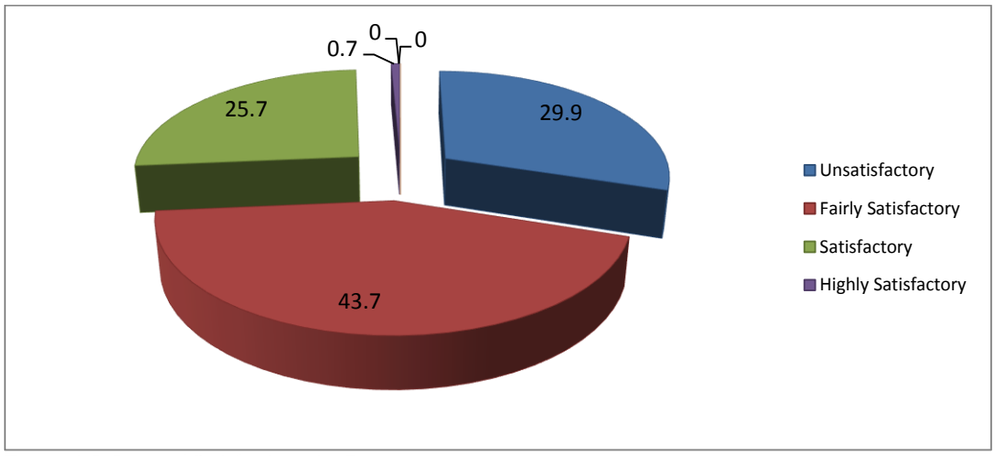

Figure 1.6: Level of Satisfaction with Roads
Source: Authors Field Survey, 2014.

Level of Satisfaction with Healthcare Delivery

As shown in Table 3, 29.9% of the population were also not satisfied with the delivery of healthcare services. This is an indication that health services are appreciated by a considerable fraction of the population as shown in the chart below.

Table 3. Level of Satisfaction with Healthcare Delivery

Level of Satisfaction with Healthcare Delivery	Frequency	Percentage
Unsatisfactory	80	29.9
Fairly satisfactory	115	42.9
Satisfactory	66	24.6
Highly satisfactory	7	2.6
Total	268	100.0

Source: Field Survey, 2014.

Level of Satisfaction with Primary Schools

The survey revealed that 29.9% of the respondents are not satisfied with the primary schools within the settlement. However, 41.8% of the respondents are fairly satisfied and 28.4% are satisfied with the provision of primary schools within the settlement.

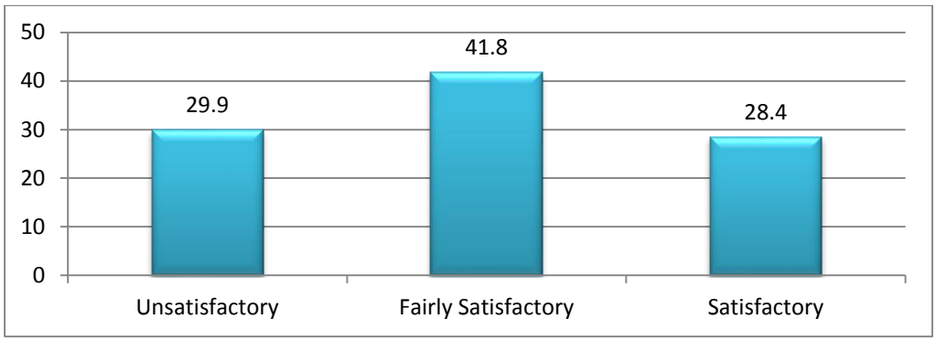

Figure 1.7: Level of Satisfaction with Primary Schools
Source: Authors Field Survey, 2014.

Level of Satisfaction with Secondary Schools

The availability of secondary schools within the settlement gives the settlers the opportunity to decide on which school they would want to enrol in. Thus, only 0.4% of the respondents are not satisfied with the secondary schools.

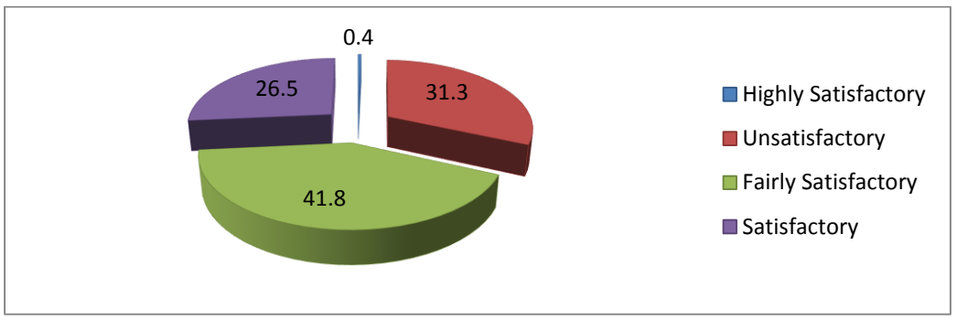

Figure 1.8: Level of Satisfaction with Secondary Schools
Source: Authors Field Survey, 2014.

Level of Satisfaction with Electricity Supply

Electricity supply is not a major problem of the inhabitants, as 40.7% of the respondents are fairly satisfied with the supply and 26.1% of the respondents are satisfied with the electricity supply.

Table 4. Level of Satisfaction with Electricity Supply

Level of Satisfaction with Electricity Supply	Frequency	Percentage
Unsatisfactory	89	33.2
Fairly satisfactory	109	40.7
Satisfactory	70	26.1
Total	268	100.0

Source: Field Survey, 2014.

Level of Satisfaction with Water Supply

The survey conducted reveals that 30.6% of the sampled population are unsatisfied with the water supply in the settlement. Thus, there is need to improve on the sources of water supply in order to address the problem.

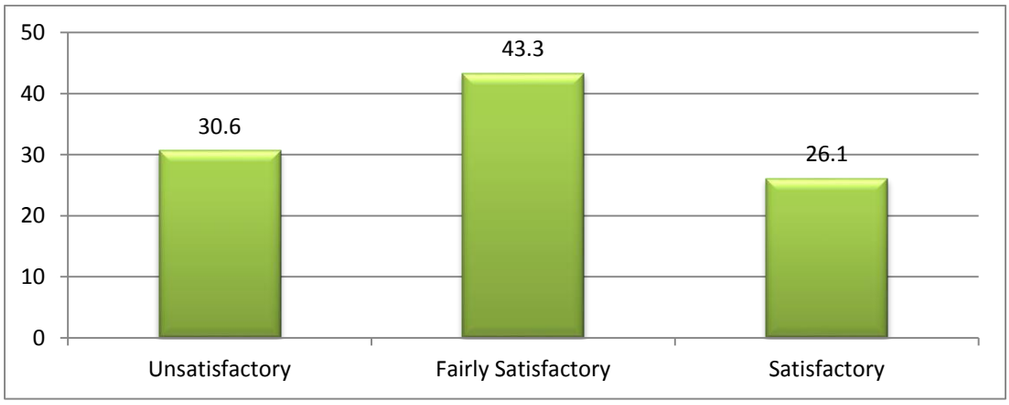

Figure 1.9: Level of Satisfaction with Water Supply **Source:** Authors Field Survey, 2014.

CONCLUSION AND RECOMMENDATIONS

The study revealed that the inhabitants have successfully adjusted to their new settlement due to the presence and availability of the basic infrastructural facilities and services within the settlement. With regards to housing however, the study revealed that the settlement is free from congestion as average housing density stands at 7 to 8 persons per household. Environmental quality however should be monitored, as the residents have poor waste disposal practices. The distribution of utilities and service was not evenly carried out as a result some residents have to travel long distances to get to some facilities and services.

Resettlement programmes have a way of improving the standard of living of displaced persons if well-conceived and planned. This study has shown that the residents of SabonWuse have adjusted to their new settlement. The public participatory planning system would have gone a long way to reduce the duration of time needed for necessary adjustments to be made. People tend to accept planning ideas and initiatives if they play one role or the other in the decision making process, thus the need for public participation in the resettlement planning process.

In the area of economic development, the residents have been able to secure alternative jobs due to the location of the settlement. The proximity of the settlement to the Local Government Secretariat, the Umaru Musa Yar'adua Memorial Hospital, the Government Secondary Schools in the area, the police posts and several other government establishments have created job opportunities that have absorbed a good number of the residents.

Based on the findings, the following were recommended:

i. Due to the loss of farmlands of 18.7% of the respondents, there is need to provide this population with alternative farmlands for their farming activities or the creation alternative sources of livelihood.

ii. With regards to the situation of road circulation within the settlement, 43.7% of the respondents are fairly satisfied with the circulation within the settlement, while 29.9% of the respondents are not satisfied this implies that repairs and maintenance of these roads should be the concern of both the government and the settlers. The government should provide the machinery and expertise for road construction while the community should also provide manpower resources in order to facilitate road construction.

iii. 28.4%and 41.8% of the respondents are satisfied with the provision of primary and secondary schools respectively, however the challenges faced by the schools is that of facilities and infrastructure within the school such as; libraries, sports facilities, school clinics, chairs and tables and so on. Thus the government schools should be equipped with the necessary facilities that are needed.

iv. Power supply is needed for most of the economic activities within the settlement. However, the supply is not always sufficient for use. Thus, there is need to make electricity power available at all times to ensure optimum production in all areas of economic development.

v. Water supply was found to be adequate as only 33.2% of the respondents are not satisfied with the supply of water. Therefore, plans must be put in place to provide more boreholes within the settlement because the population will definitely grow with time and so also the need for water. Maintenance of the available sources of water is also necessary to ensure continuous satisfaction from these sources.

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INSTITUTIONAL AND COMMUNITY AWARENESS ON THE ENVIRONMENTAL IMPACT OF MUNICIPAL SOLID WASTE MANAGEMENT IN BIDA METROPOLIS, NIGERIA

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Nowadays, achieving safe and environmentally sound Solid Waste Management system is a serious problem, because Solid Waste Disposal sites are found on the out skirts of the urban areas, turning in to the major causes of environmental problems, resulting in surface and ground water pollution, land degradation, affecting soil quality and etc. Furthermore, those sites are becoming the source of contamination due to the incubation and proliferation of flies, rodents, mosquitoes; that in turn, are disease transmitters that affect population's health. What to do with solid wastes has long troubled governments, communities, and individuals. Therefore, this study was designed and conducted to assess the institutional and community awareness on the environmental impact of solid waste management practice, and to determine its role, in Bida town, North Central Nigeria. Data were collected from 380 randomly selected sampled households using open ended and close ended questionnaires, and from purposively selected staff of NISEPA using semi structured interview. In order to support and realize the data obtained from sample respondents, observation using check lists also conducted. The result of the study shows; Food waste and their packaging as a major type of solid waste of the study area, Residential sources as a major source of the dominant types of solid wastes of Bida town, the prevalence of environmentally un advisable disposal system such as open dumping and open burning, lack of solid waste collection materials, financial problems as major factors affecting the value of community and institutional awareness and the solid waste management systems of the study area. The study also noted the poor and uncontrolled Solid Waste Management of the study area caused serious environmental and health problems, and made the town to have smelly and ugly appearance. The study concludes that Solid Waste Management system of the study area should be changed and needs to apply the principle of Integrated Sustainable Solid Waste Management System. Therefore, the study finally recommended the solution measures required to be taken including the provision of sufficiently available and properly located solid waste disposal sites, provision of solid waste collection materials.

Keywords: Institution, Community, Awareness, Environmental, Impact Municipal Solid Waste Management, Practice, Bida

INTRODUCTION

Waste is any substance (whether solid, liquid or gaseous) that is discharged, emitted or deposited in the environment in such a volume constituency or manner as to cause an alteration in the environment. Waste is also any discarded, rejected, unwanted, surplus or abandoned substance. While solid waste is defined as the organic and inorganic waste materials produced by households, commercial and industrial establishments that have no economic value to owner (UNEP, 2004). Nearly all human activities produce waste. Solid waste is generated during the acquisition of raw materials, during refining and manufacturing process and when products are used by consumers. Problems with the disposal of wastes can be traced from the time when humans first began to congregate in tribes, villages and communities, and the accumulation of waste became a consequence of life (Sangho and Sackey, 2007).

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Municipal solid waste management system involves various activities like storage, collection, transportations and disposal. These activities if not properly controlled and with proper precautionary measures adopted, may have adverse impact on land, water, and air environment, human and environmental health, aesthetics and quality of life (Justine, 1993). The environmental and Health Impact Assessment may help in increasing the potential adverse effects of these activities and in formulation of precautions which could prevent these effects from taking place (UNEP, 2009). To practice an effective municipal solid waste management, technology has to improve on the burden of clean up efforts to future generations. On the other hand, a wise choice of a logical technology or practice can resolve present problems adequately, while preserving funds for expeditiously resolving other environmental, social or economic problems (Yuan, 2000).

The current stoke of urban housing is both insufficient and of very poor quality. The serious deficiencies in sanitation services and inadequacy of sewerage infrastructure and random defection in urban areas have created dangerous health and environmental problems. Environmental changes brought about by the process of urbanization have led to massive solid waste generation and problem of its management (Abd'Razack *et al.*, 2013).

Among the reasons that led to these situations are; in adequate resource mobilization, lack of adequate institutional arrangement, and low technical sustainability (Hall, 1994). In towns, the sanitary board collects refuse from houses and arranges for its disposal. Each house should use a strong dust bin for the storage of house hold refuse (Godman and Weber, 1994). Costs of waste management include changes in waste storage, collection and disposal, and costs of avoiding leakage of waste into water courses (Guy, 2000). With the local governments of developing countries, expenditure for municipal solid waste service is usually from 20 percent to 50 percent of total municipal expenditure. Even at such a high level of expenditure, the level of solid waste services is low and only 50 percent to 70 percent of the solid waste is collected (Sandra, 1995).

Study Area

Bida is an organic town that has developed before the advent of modern town planning in North Central region of Nigeria. Bida has an area extent of 51 km² and a population of 188,181 at the 2006 census (NPC, 2011). Bida metropolis lies at 9°05′N and 6°01′E on the Nupe Sandstone formation which consists of plains with ironstone capped hills or mesas and has an altitude of 151m above mean sea level. The scenery is fairly uniform since lithology and rock structure are not greatly variable. An important feature of the scenery is the existence of large areas of fadama. The northern edge of the town consists of broken-off plateau. From the foot of two flat-topped hills the town sweeps down into the plain. The town is drained by the Chiken and Mussa streams with the third stream Lanzu which flows right across the heart of the town (Kawu, 2013). Figure 1shows the geographical location of Bida Township.

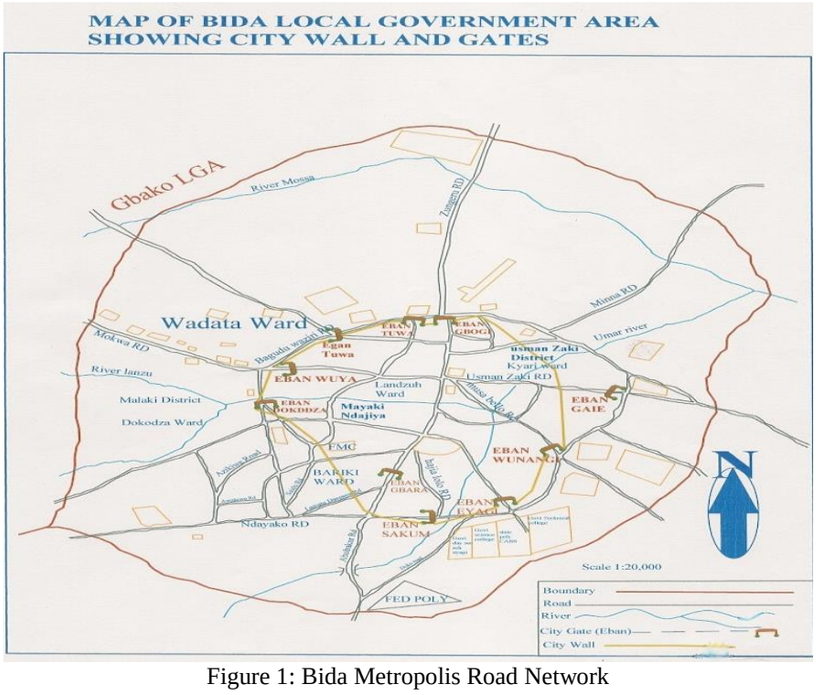

Figure 1: Bida Metropolis Road Network

According to the 2006 National Census exercise, Bida has a population of 188,181 (NPC 2011). Projecting the population of Bida to this current year (2016) using a base of 2006 and a population of 188,181, with a growth rate of 3.5% per annum, the new projected population is 269,099. This population is a mix of various tribes, though predominantly Nupe. Over the years, people from other parts of the country have come to settle in Bida due to various reasons ranging from marriage, job transfers, and employment opportunities.

RESEARCH METHODOLOGY

This paper employed mixed method (both qualitative and quantitative method) to analysed the set research questions. Purposive and probability sampling was employed for selection of households for the study. Qualitative method was employed to show the perception of the residents to environmental quality and the quantitative method was employed to compute the analysis using simple statistical analysis such as frequencies, percentages, chi square and correlation analysis.

The primary data collected include the amount of waste being generated on daily basis, the type of solid waste management practice for waste disposal, the perception of the residents to waste management, the responsibility of the household to environmental management, the perception of the residents to ability of the responsible agencies to collect and manage solid waste, the factors responsible for the practices adopted for solid waste management in the town, the responsible agencies among others. The secondary data was obtained from different documents related to solid waste practices and management and those found in the Municipality of Bida metropolis and in the Niger State Environmental Protection Agency (NISEPA) office in the town.

The projected population is therefore 269,099. Households were used as unit of measurement of the population of Bida metropolis the study area. Therefore the population for the study was 44,850 based on 6 people per household from where the sample for the study was selected and the sample sizes for the study were 397 households. Random sampling was used to administer the questionnaire in each of the selected neighbourhoods. A total of 380 questionnaires were valid for the analysis of the study.

RESULTS AND DISCUSSION

Solid Wastes Generation in Bida Township

This section of the study discusses the types of solid waste generated in Bida metropolis and the major sources of solid waste in the metropolis. The findings were presented thus:

Types of Solid Wastes Generated in Bida Township

This research identifies five major solid waste material which are vegetative materials, paper, bottle, packaging, plastic and Nylon, food left over, Aluminium, metal scraps and construction materials. The proportion of these types of waste varies from households and neighbourgoods. Figure 4.1shows the proportion of different solid waste components in the study area as analysed from the research.

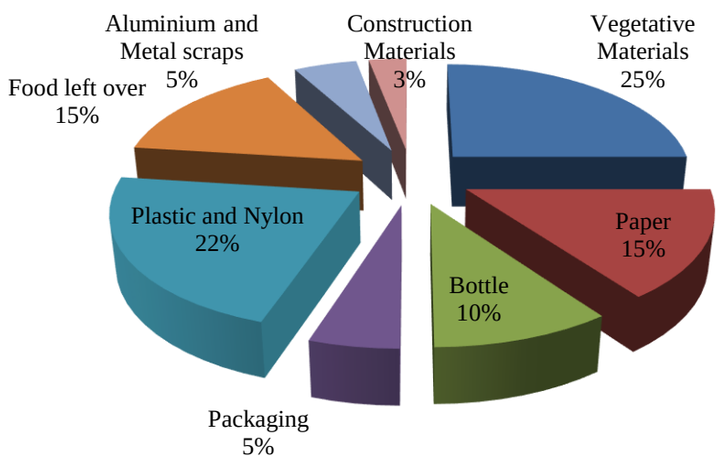

Figure 2: Types of solid wastes regularly generated from the Bida Township

Figure 2 indicates that the major types of solid wastes regularly generated from the town include vegetative matter, plastic and Nylon, Paper and Food left over. The implication of these types of waste being generated implies the breeding of pesticides and rodents which feed on the waste and thereby causing havoc of diseases.

The analysis of the response from the NISEPA and health office of Bida LGA also corroborated the response of the people of the town that solid waste materials usually generated in the town include food left over, packaging, papers, wood, plastics, concrete, dirt and others.

Major Sources of Solid Wastes in Bida Metropolis

Table 1shows that there are different types of solid wastes generated from different sources in Bida metropolis that includes residential solid waste generated is higher percentage of waste in the metropolis, followed by agricultural waste and least contributor is construction waste.

Table 1: Major Sources of Solid Wastes in Bida Metropolis

Source of Waste	No of Respondents	Percentage
Residential	192	50.53
Commercial	62	16.34
Institutional	20	5.26
Construction	15	3.95
Agricultural	60	15.79
others	31	8.16
Total	380	100.00

Source: Author's Field Survey, 2017.

The implication of this is that the agencies responsible for waste collection and management need to target the residential and commercial locations for solid waste collection. Also, the analysis of the data from the NISEPA zonal office in Bida indicated that the major sources of the solid wastes generated in the town is residential area which contributed large proportion of the waste ranging from food left over, plastic and nylon, vegetative waste, wood, ashes and others. This is follows by agricultural waste. NISEPA are facing problem of determining the proportion of these waste because there was no sorting of these waste before dumping at the dumpsite for evacuation by the authority.

Solid Waste Disposal Method in Bida Metropolis

This section of the findings revealed the spatial distribution of solid waste dumpsites in Bida metropolis, the types of solid waste disposal methods, the legality of the solid waste dumpsites and communal municipal solid waste management practices in Bida metropolis

Spatial Distribution of Solid Waste Dumpsites in Bida Metropolis

The spatial distribution of the dump site found in Bida metropolis indicated that there are uncountable numbers of waste disposal sites in the town, but the record of the NISEPA indicated that there are six legal disposal sites in the town while there are numerous illegal waste sites in the town. This is as a result of conveniences by the residents who disposed their solid waste indiscriminately. Several factors contributed to the illegal disposal of the waste such as available open spaces, vacant plots, non-challant attitude of the people to hygiene and others. Table 2 shows the spatial distribution of waste dumpsites in the town. There are six legal dumpsite that are legally recognised in the town by the Niger State Environmental Protection Agency (NISEPA), however, this is not adequate to cater for the collection of the entire volume of solid waste generated in the town and then there emerges several illegal dump sites due to the need of the households to disposed off their waste. The preference is proximity to the households abode.

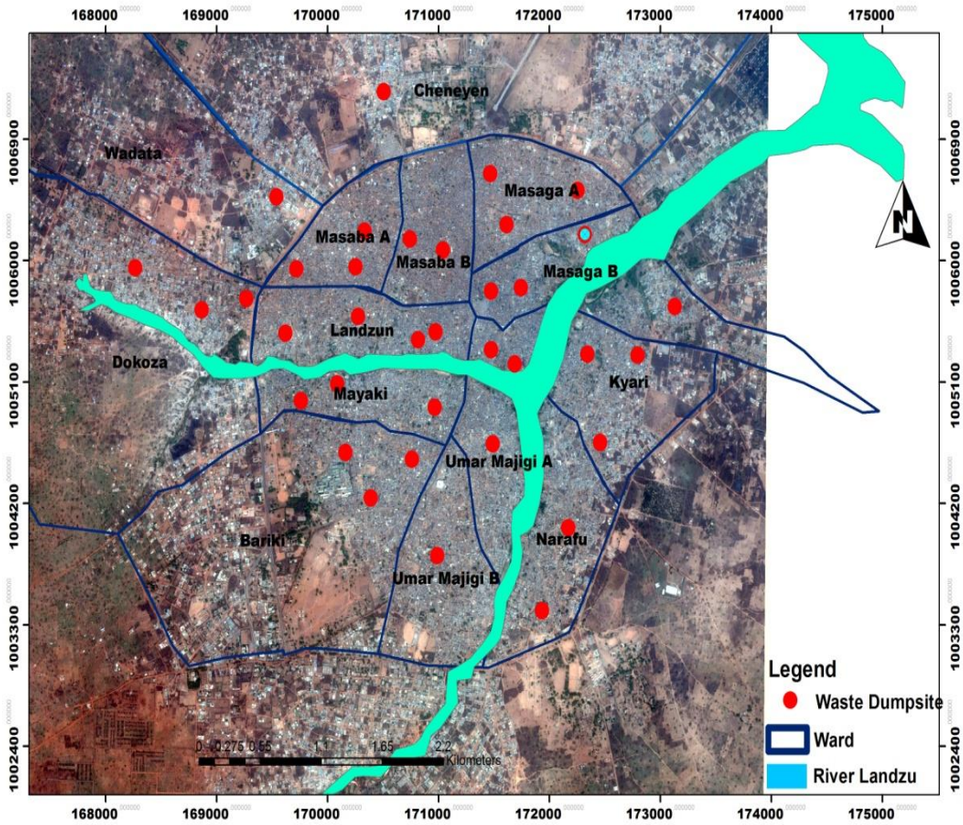

Figure 2: Spatial Locations of Geo-Referenced Dump Sites in Bida Town
Source: Author's Field Survey, July, 2017

Types of Solid Waste Disposal in Bida Metropolis

There are three major types of solid waste disposal usually practiced by the residents of Bida metropolis; these are open dumping at both legal and illegal solid waste disposal dumpsites (52.63%). Burning is another method of disposal by the respondents usually practiced in the town (11.6%) and dumping to the river channels is also a method of disposal (31.9%) while other method such as composting, burying to the ground are also employed at a lower scale (5.0%). Table 3 shows the method of waste disposal commonly used by the residents of Bida Township.

Table 3: Method of Municipal Solid Wastes Disposal in Bida Metropolis

Source of Waste	No of Respondents	Percentage
Open Dump	200	52.63
Burning	44	11.58
Disposed to water Channels	121	31.84
Others	15	3.95
Total	380	100.00

Source: Author's Field Survey, 2017.

The result of the NISEPA method of waste management in the town indicated that open dumping and open-burning are the primary system used by NISEPA to manage the waste in the town due to non availability of necessary facilities for proper collection of solid wastes generated from the town and landfill site in the town.

Researchers have proved that open burning is the most unacceptable method of disposal of solid waste (Abd'Razack *et al.,* 2013). The low temperature burning of plastics and PVC will emit highly toxic gases such as dioxins and nitrous oxides to the atmosphere. Open dumping is uncontrolled and scattered deposit of wastes at a site. It leads to acute pollution problems, fires, high risk of disease transmission and open access to scavengers and animals. It is not a scientific way of waste disposal because open dumping is an uncovered site used for disposal without environmental controls (Mohammed *et al,* 2012).

Legality of Municipal Solid Waste Disposal Sites in Bida Metropolis

The study also looked at the number of Municipal solid waste disposal sites legally instituted by the NISEPA and the total number of illegal dump sites created by the inhabitants of the metropolis so as to create convenience for their disposal. The analysis of the NISEPA Area office indicated that there are six (6) legally designated municipal solid waste disposal sites in the town. The physical observation therefore indicated that there are about 20 illegal sites

identified during the cause of the research. Table 4 indicated the number of legal and illegal dumpsites identified in Bida metropolis.

Table 4: Number of available Municipal Solid waste disposal sites in Bida Metropolis

Types of Dump sites	Number	Percentage
Legal	6	16.7
Illegal	20	55.6
Water channels	10	27.7
Total	36	100.00

Source: Author's Field Survey, 2017.

The result indicates that 83.33% of the municipal dump sites in Bida town are illegal in nature. This implies that the level of waste collection is limited in the city as the NISEPA officials indicated that their role is based on the legal dump sites in their records. This also implies that large chunk of waste are left unattended to in the town. Therefore, it follows the slogan of garbage city rather than garden city.

Communal Municipal Solid Waste Management Practices in Bida Metropolis

Analysis of the Municipal Solid Waste management in Bida metropolis indicated that there were several methods employed to manage solid waste in Bida metropolis. The first method is the transfer of municipal solid waste from the neighbourhoods to the outskirt of the town by the NISEPA authority. They collected waste from the town and deposit them at the outskirt along Bida – Doko road. It is about 7 Km from the city centre. The waste are just dump there for it to decompose and their non-biodegradable waste are just left unattended to except little sorting made by the staff to remove aluminium cans, metal scraps, plastic and bottle for sale to junk shops in the town. Though it reduces the solid waste but the quantities reduced are negligible compared to the total waste generated in the town.

The other method employed by the residents of Bida metropolis to manage waste include open burning despites its environmental consequences, disposal to water channels and burying of the waste. The analysis was shown in Figure 4.3. The analysis indicated that about 70.0% of respondents believe in burning of the waste at the dump sites and in their homes.

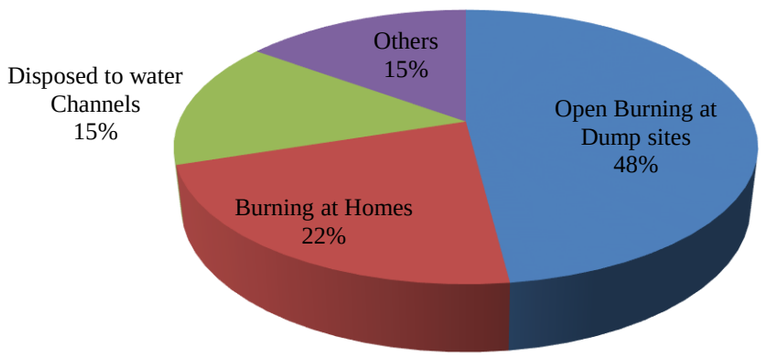

Figure 3: Method of Municipal Solid Wastes Management in Bida Metropolis

Volume of Municipal Waste Generated in Bida Metropolis

The analysis of the waste generated in Bida Township and the result shows that different neighbourhoods produce higher waste than the others. It was proved that places like GRA (High income households) generated higher waste (about 0.72 Kg per capita per day) compared to places such as Banwuya where the waste generated was about 0.54 Kg per capita per day because of the household size. Table 5 shows the rate of waste generated by different households in some selected neighbourhoods in Bida metropolis.

Table 5: Volume of Waste Generated by Households in Bida Metropolis

Neighbourhood	**Household Size**	**Amount of waste Generated/Week (Kg)**	**Waste/capita/day (Kg)**
GRA	3	15.22	0.72
Banwuya	6	382.40	0.54

Source: Author's Field Survey, July, 2017.

Using the population of Bida and the average household size of about 7 persons per households, it implies that about 0.56 Kg of solid waste is generated per capita per day. It

implies that each household generates between 2.16 Kg and 5.46 kg per day while about 5.98 tonnes of waste is being generated per day in Bida metropolis.

Municipal Solid Waste Storage Methods in Bida Metropolis

Table 6 shows the methods of solid waste storage methods employed by the residents of Bida metropolis to store their solid waste before disposal. Due to the fact that the town is an organic settlement, several storage method employed include non-conventional method such as palm tree font basket to more conventional method of metal drums supplied by the NISEPA.

The analysis shows that 10.52% of respondents disposed their municipal solid waste by engaging the service of NISEPA staff on daily basis, because of the availability of drums and their location on the highways, the designated dump sites and GRA while 89.48% dump their solid waste indiscriminately. This implies that the most used storage method is plastic bucket. The reasons for the usage are that it is very easy to convey to various disposal point due to its light weight and also, it is less expensive. The study also established that majority of the respondents are not aware of the dump site as undesignated dump site. Because of lack of waste collection points, nobody cares to enquire whether the site they dump the waste to is legal or illegal.

Table 6: **Method of Waste Storage in Bida Township**

Storage Facilities	Number of Respondents	(%)
Palm Tree Font Basket	84	22.10
Plastic Bucket	67	17.63
Cotton Sack	77	20.26
Drum	40	10.52
Nylon Bag	59	15.52
Bagco Bag	43	11.31
Others	10	2.63
Total	**380**	**100.0**

Source: Author's Field Survey, July 2017.

Frequency of Municipal Solid Waste Disposal in Bida Township

Analysis of the frequency of the disposal of the waste generated by the households in Bida town indicated that daily disposal is more favoured which is a clear indication that they often dump their waste on daily basis. This was followed by weekly basis as the residents claimed to always dump their wastes on Saturdays and Sundays which is weekend because of the nature of their job and time. 13.95% of the respondents usually dump their solid waste fortnightly, while 2.63%disposed off their waste on monthly basis. This is presented in Table 7.

Table 7: Frequency of Waste Disposal in Bida Township

Frequency of Disposal	Number of Respondents	(%)
Daily	228	60.00
Weekly	89	23.42
Fortnightly	53	13.95
Monthly	10	2.63
Total	**380**	**100.0**

Source: Author's Field Survey, July 2017.

The analysis indicated that there is little attention paid to municipal solid waste disposal by the people of Bida town. The anticipated consequences were not given attention by the people.

Method of Waste Collection by NISEPA in Bida Township

Analysis of the volume of waste collection by NISEPA in Bida Township indicated that they are not coping with the extent of the waste generation. Coupled with the fact that they are not interested in the illegal dump site to collect waste has pit the town at risk of epidemics. The analysis indicated that the authority have only two trucks which plies the town twice on a daily basis. The analysis indicated that a truck can convey only 7 Tonnes of waste per trip. This therefore implies that the total waste collected per day were about 28.00 Tonnes. On the contrary the municipal solid waste generated in Bida on daily basis was about 54.82 Tonnes. Table 8 shows the volume of waste generated and evacuated on daily basis in Bida.

Table 8: Volume of Municipal Waste Collected by NISEPA in Bida Township

Frequency of Disposal	0.56Kg/capita/day	(%)
Solid waste generated	54.82	
Solid waste collected by NISEPA	28.00	51.08

Leftover	26.82	48.92

Source: Author's Field Survey, July 2017.

The analysis indicated that nearly 49% of the municipal solid wastes generated in Bida town are unattended to. Therefore, the residents resort to burning at dump sites and at homes.

Perceived Effect of the Method of Solid Waste Disposal in Bida Township

In order to achieve the aim of the study concerning the discovering the type disposal system usually practiced by the residents of the town and assess the disposal methods that is employed for solid waste disposal practiced in the town which has direct consequences on the environment and on the health of the people. The perception of the resident of the town is presented in Table 9.

Table 9: Perceived Effect of Disposal Method of Solid Wastes in Bida Township

Source of Waste	No of Respondents	Percentage
Air Pollution	105	27.63
Water Pollution	120	52.63
Land Degradation	90	23.68
Climate Change	55	14.47
Others	10	2.63
Total	380	100.00

Source: Author's Field Survey, July, 2017.

The perception varies based on the level of exposure to effect of respondents to effect of indiscriminate dumping of solid waste without proper management. Air pollution and water pollution are the most common negative effect identified. Although both open dumping and open burning are environmentally able to cause pollution in the air we breathe and water we drink and soil and land degradation, regarding the communal disposal system in the town. Lack of landfill site by NISEPA also have effect on the waste disposal method, therefore, NISEPA have to provide landfill that should be designed, located at the outskirt of the town and operated based on national, international guidelines, environmental impact analyses, and environmental friendly which take into consideration the accurate climate date precipitation, evaporation, temperature, and wind direction beside the location from residential areas and the groundwater level.

Institutional and Community Awareness on the Environmental Impact of Municipal Solid Waste Management Practices in Bida Township

The analysis of the data obtained from staff of Bida Local Government Health Department and NISEPA area office in Bida town concerning the institutional awareness on the environmental impact of Municipal Solid Waste Management practice shows that there is adequate awareness on the subject matter. Principally the data from health office indicated. Despite the awareness, there is of sufficient equipments and manpower to make the other generators of municipal solid waste to be up to their responsibility in disposing their solid wastes properly.

Institutional Awareness on the Environmental Impact of Municipal Solid Waste Management Practices in Bida Township

The analysis of the data from the staff of NISEPA area office in Bida shows that inadequate information and awareness campaign by NISEPA has being one of the problems confronting the organization in handling waste in the town. The awareness level of the staff is higher concerning the environmental impact of municipal solid waste management practice obtained from experiences of working with the organization. Also the staff of the NISEPA proved that many residents of the town has some form of knowledge about the environmental impact of Municipal Solid Waste Management practice due to constant dissemination of information through the electronic media. The NISEPA staff opined that there is always information to the public on pollution tendencies of Municipal Solid Waste to the surface water and facilitate the cause of environmental diseases. The NISEPA staff also believes that the problem of Municipal Solid Waste is not lack of awareness, rather lack of adequate infrastructure for waste collection, disposal and management and lack of adequate and environmentally safe dumpsites. Table 10 shows the relative index of the level of awareness by the government institutions to environmental impact of municipal solid waste management practices in Bida town.

Table 10: Perception of Institutional to the Environmental Impact of Municipal Solid Waste Management Practices in Bida Township

Statements	Rating of Perception					API	Rank
	5	4	3	2	1		
High level of awareness on the environmental impact of MSWM practice	1.21	1.05	0.81	0.52	0.40	3.99	1st
Lack of adequate infrastructure for waste disposal	1.05	1.00	0.92	0.71	0.30	3.98	2nd
Lack of adequate infrastructure for waste collection	1.21	1.05	0.99	0.51	0.63	3.88	3rd
Lack of adequate and environmentally safe dumpsites	1.06	1.00	1.11	0.40	0.25	3.82	4th
Lack of adequate infrastructure for waste management	1.00	1.02	0.90	0.70	0.16	3.78	5th
Pollution tendencies of Municipal Solid Waste to the surface water	0.95	0.92	0.77	0.60	0.36	3.56	6th
Constant dissemination of information through the electronic media	0.90	0.75	0.65	0.50	0.65	3.45	7th
Mean Awareness Perception Index						**3.78**	

Source: Author's Field Survey, July, 2017

The analysis of the Awareness Perception Index of the institutions in Bida town on environmental impact of Municipal Solid Waste indicated that it was 3.78 (Desirable Level). This implies that there is high level of awareness on the environmental impact of Municipal Solid Waste Management practices in Bida town. The analysis revealed that four (4) factors contributed to the desirable level of awareness above the mean value while two (2) variables contributed below the desired awareness level. This implies that there is correlation between level of awareness and environmental impact of municipal solid waste management practices in Bida town. The higher the level of awareness, the higher the level of environmental impact of municipal solid waste management practices.

Community Awareness on the Environmental Impact of Municipal Solid Waste Management Practices in Bida Township

Analysis of the perception and awareness of the residents of Bida Township concerning the environmental effect of Municipal Solid Waste Management practices indicated that there is little awareness on the effect such as surface water pollution, air pollution, loss of amenity, loss of soil quality, land management and conservation problems. On the other hand, about 25.0% of respondents were aware of the environmental impact of Municipal Solid Waste Management practice in the town. A critical component in any waste management program is public awareness and participation in addition to appropriate legislation, strong technical support.

Table 11: Residents Awareness on the Environmental Impact of MSW Practices in Bida Township

Statements	Rating of Perception					API	Rank
	5	4	3	2	1		
Having a clean environment is vital to health	0.70	0.50	0.60	0.55	0.71	3.06	1st
I an awareness that poor MSWP lead to water Pollution	0.62	0.54	0.56	0.60	0.50	2.82	2nd
I an awareness that poor MSWP lead to Air Pollution	0.62	0.44	0.48	0.50	0.60	2.74	3rd
I an awareness that poor MSWP lead to Land Pollution	0.62	0.55	0.38	0.44	0.65	2.64	4th
I an awareness that poor MSWP lead to loss of Amenities	0.72	0.44	0.30	0.60	0.52	2.58	5th
I an awareness that poor MSWP lead to water Pollution	0.70	0.40	0.32	0.70	0.42	2.54	6th
I an awareness that poor MSWP lead to soil Erosion	0.72	0.42	0.30	0.50	0.54	2.48	7th
I an awareness that poor MSWP lead to problem of land management	0.80	0.36	0.44	0.45	0.32	2.37	8th
It concerns me if I see garbage scattered anywhere in the city	0.75	0.44	0.50	0.56	0.10	2.35	9th
I an awareness that poor MSWP lead to environmental conservation	0.66	0.55	0.33	0.20	0.58	2.32	10th
Mean API						**2.59**	

Source: Author's Field Survey, July, 2017

The analysis indicated that the mean level of awareness (API) is 2.59 which when interpreted implies undesirable level of awareness. This implies that the level of awareness of the

residents of Bida town to environmental effect of poor Municipal Solid Waste Management practice is low and undesirable.

The analysis indicated that 4 variables contributed immensely to the API (value above 2.59) while 6 variables contributed sparingly to the level of awareness (value less than 2.59). In essence, the level of awareness to environmental effect of poor Municipal Solid Waste Management practice in Bida town is very low. This can be seen manifesting in the manner and ways of indiscriminately dumping of Municipal Solid Waste within the town. It affects the aesthetic nature of the environment and breeding ground for pathogens and rodents that causes diseases and epidemics.

Factors Responsible for Unfriendly Municipal Solid Waste Management practices in Bida Township

Analysis of the factors responsible for indiscriminate practice of solid waste disposal in Bida town revealed that several factors are responsible such as lack of collection points close to their residents, absence of enough disposal sites, absence of planned solid waste collection activity by NISEPA, open dumping and open burning make disposal more easier to dump the municipal solid waste generated in the house amongst others. All these factors have effect on the environment. Table 12 shows the respondent view on the factors responsible form unfriendly municipal solid waste management practices in Bida Town.

Table 12: Factors Responsible for Unfriendly Municipal Solid Waste Management practices in Bida Township

Source of Waste	No of Respondents	Percentage
Lack of collection point	115	30.26
Absence of collection truck andcrew	100	26.32
Lack of planned dump site	80	21.05
Open dump and burning	60	15.79
Others	25	6.58
Total	380	100.00

Source: Author's Field Survey, July, 2017

Lack of collection point close to households and absence of collection truck and collection crew in the neighbourhoods accounts for 57% of the reason for indiscriminate municipal solid waste disposal and therefore influence the management practice in Bida town. Generally, the institutional and community awareness on the environmental impact of Municipal Solid Waste Management practice is vital for environmentally safe and effective Solid Waste Management system, the analysis of the result of this study shows that API value of level of awareness in Bida Township was determined by lack and shortage of the necessary equipments and materials used for effective management of solid wastes on the part of the staff and importance of environmental safety and sustainability are lower.

Effect of Improper Solid Waste Management Practices in Bida Township

The Municipal Solid Waste Management Manual (2000) indicated that uncontrolled municipal solid waste through the indiscriminate dumping can lead to obstruction of runoff water. The consequences are formation of pool of stagnant water bodies that become the breeding ground for pathogen the cause disease.

The Environmental Challenges due to Improper Municipal Solid Waste Management system in Bida Township

One of the attendant effects of improper solid waste disposal is unsanitary and environmentally unfriendly sources of environmental diseases. This provided opportunity for breeding of pathogens, flies and rodents. EPA (1995) itemized some solid waste material as dangerous for human health, items such as broken glass, razor, hypodermic needles, and other health care wastes can pose a risks to people exposed to them. This can lead to injury to people, poisoning especially. The result of the study on contribution of improper municipal solid waste management practice on environmental disease is presented in Table 13.

Table 13: Environmental Challenges due to Improper MSWM system in Bida Township

Environmental Challenges	No of Respondents	Percentage
Injury	50	13.16

Aesthetic and odor problem	60	15.79
Stagnation of Run-offs	40	10.53
Breeding ground for Mosquitoes	110	28.95
Breeding ground for Rodents	60	15.79
Breeding ground for Flies	45	11.84
Others	15	3.94
Total	380	100.00

Source: Author's Field Survey, July, 2017

The findings shows that all the environmental challenges are associated with improper municipal solid waste management practices in the town. Breeding of mosquito which happened to be the major killer diseases and infant mortality accounts for 29% while injuries and other environmental diseases accounts for 17%.Breeding of rodents and flies accounts for 27.5% of all the environmental diseases and this is fast becoming the cause and means of transmission of different kinds of diseases such as typhoid, cholera and others. Furthermore, pollution of run-offs and stagnation of polluted water in and unsanitary nature of Municipal Solid Waste Management in Bida Township has led to different water borne diseases.

Environmental Impact due to Poor MSWM System

The main apparent environmental damage created by improper municipal solid waste is problem to the aesthetic of the environment. That is municipal solid waste which littersevery nook and crannies of the town create ugly scenario and smelly neighbourhoods. The most important risk is the pollution of the air, water and soil, the effect is pollution of water sources (ground and surface water) and land.

Analysis of the result indicated that the environmental impact of poor Municipal solid waste management system in Bida town shows that 45.2% of respondents are of opinion that pollution of water is the major environmental problem, while 20.2% believe that it led to loss of amenity. Figure 4 shows the various environmental impact of improper municipal solid waste management system in Bida town.

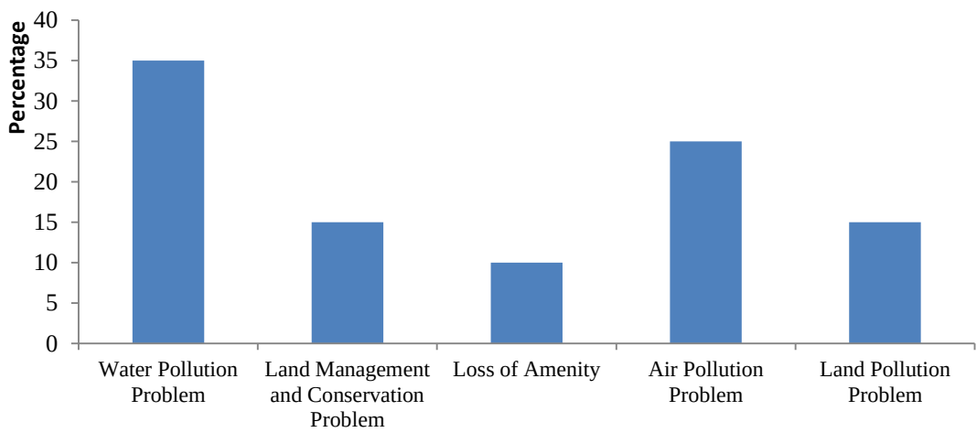

Figure 4: Environmental Impact of Improper MSWMS in Bida Town
Source: Author's Field Survey, July, 2017

Risk of Living in Proximity to Illegal Solid Waste Dump Sites in Bida Township

Figure 5 shows the location of houses inBida Township about residents living in proximity to dump sites. The analysis indicated that the level of proximity adversely affected the people. This analysis was carried out by using buffer zones to determine the proximity of residing close to dump sites. Each of the buffering circle has a radius of 100m for severe risk and 200 m for moderate risk.The residence within the buffering region of the refuse dump is adversely affected more affected than the ones farther away from the refuse dump or the buffering. Plate II shows the extent of solid waste disposal within Bida town.

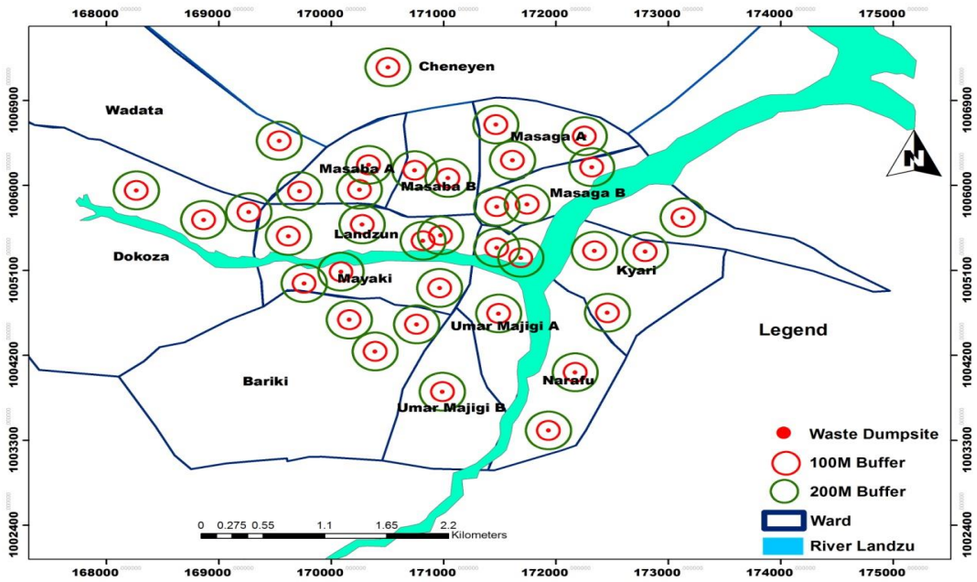

Figure 7:The Spatial Location of Houses in Bida Township about Residents Living in Proximity to Dump Sites
Source: Author'd Field Survey, July, 2017

Plate I: An Illegal Dump Site Close to Houses in Bida Town

Exposure to Solid Waste Hazard by Residents in Proximity to Illegal Solid Waste Dump Sites in Bida Metropolis.

This aspect deal with some specific problems suffered from the presence of the dump, they are as follows: foul water, Dust during hamattan, Dust at the beginning of rainy season, Dust at the end of rainy season, Rats and Rodents attack, Houseflies, mosquitoes, Defacing the physical appearance of the environment, Children playing off the dump, injuries from sharp objects of the dumps, pollution of water body and smoke from burning of the waste. Table 14 shows various exposures to solid waste hazard in Bida Township. The exposure was measured using Linkert Scale.

Table 14: Exposure to Solid Waste Hazards by Residents of Bida Metropolis

Hazard Exposed to by Proximity to dump sites	Grading of Fixed Hazard					HEI	Rank
	5	4	3	2	1		
Foul water	0.75	0.94	0.49	0.68	0.11	**2.97**	4th
Dust during hamattan	0.20	0.15	0.15	0.96	0.39	**1.85**	12th
Dust at the beginning of rainy season	0.51	0.27	1.59	0.32	0.14	**2.83**	5th
Dust at the end of rainy season	2.62	0.25	0.81	0.09	0.09	**3.86**	1st
Rats and other Rodents	0.22	0.48	0.30	0.29	0.59	**1.88**	11th
Houseflies	0.63	0.53	0.30	0.35	0.49	**2.30**	6th
Houseflies	0.50	0.53	0.30	0.35	0.49	**2.17**	7th
Mosquitoes	0.22	0.20	0.38	0.66	0.45	**1.91**	9th
Defacing the physical appearance of the environment	0.22	0.36	0.36	0.44	0.52	**1.90**	10th
Children playing of the dump	1.49	1.67	0.43	0.07	0.08	**3.74**	2nd
Injuries from sharp objects of the dumps site	2.07	0.76	0.39	0.43	0.05	**3.70**	3rd
Pollution of water	0.36	0.07	0.08	0.68	0.54	**1.73**	12th
Smoke from burning of the waste	0.54	0.11	0.39	0.31	0.58	**1.93**	8th
Mean Hazard Exposure Index (HEI)						**2.73**	

Source: Author'sField Survey, July, 2017

The analysis indicated that the mean HEI was 2.73 (undesirable). This implies that the level of exposure when living in proximity to dump site is either severe or mild.

Summary of the Findings

The findings from the study on the assessment of the types of municipal solid wastes generated in Bida metrpoplis revealed that it comprises mainly vegetative matters (25%); paper (15%); plastic (22%); food leftover (15%). Others are packaging materials, construction waste, bottles, aluminum and metal scraps among others. In findings also revealed that residential sources of waste is the prominent in Bida town (50.5%). Others such as commercial waste, institutional waste and agricultural waste account for 38.0% while others accounts for 11.5%. The town suffers from massive municipal solid waste generated on daily basis.

Also, the analysis of the spatial spread of the waste dump sites indicated that, there are 6 recognized legal dump sites and 30 illegal dumpsites making the total dumpsites in Bida to be 36 in number. These dump sites are scattered round the whole town as shown in Figure 4. The most favoured method of waste disposal in Bida were open dump (52.6%); burning (11.6%) and dumping to water channel especially during raining season and along river landzu (31.8%). The use of buying and composting is not favoured and not used as a means of municipal solid waste disposal in Bida town.

The volume of municipal solid waste generated in Bida town followed the norm that high income households generates more waste, and low income neighbourhoods generated higher municipal solid waste. The location such as GRA and Poly road in Bida town generated an average of 0.72 Kg per capita per day while Location such as Banwuya, Hajia Lolo amongst other generated 0.54 Kg per capita per day. The average waste per capita per day in Bida is about 0.56 Kg. the total amount of waste generated based on the 2016 population estimate was about 5.98 tonnes per day.

The municipal solid waste storage in Bida town involve the use of biodegradable basket (26.1%); plastic bucket (17.6%); sack (20.3%) and host of other such as bacgo sack cotton sack, nylon bags which accounts for 36%. Also the method of storage of municipal solid waste before disposal indicated that large proportion (60%) store their waste for only a day(implying daily disposal), other such as weekly, fortnightly and monthly accounts for 40%.

The institutional and community awareness indicated that they are at cross road. While the institutions were having a better awareness, the mean Awareness Perception Index (API) by the staff of NISEPA was 3.76 (desirable condition), the community Awareness Perception Index (API) was 2.59 (Undesirable condition). This has led to the residents of Bida town to engaged in the used of open dumping and open burning, which are environmentally unadvisable, as a main technique of municipal solid waste disposal. The study also shows that the environmental problems caused by the indiscriminate municipal solid waste management practices in Bida include water pollution (52.6%); air pollution (28.6%); land management and conservation problems (23.1%) and climate change (14.5%).

The effect of improper municipal solid waste management practices in Bida has resulted into environmental diseases such as injury (13.1%); distortion to environment aesthetics (16%); breeding of mosquitoes (29%); breeding of rodents and flies (28%). The risk of living in proximity to municipal solid waste dump sites shows that there is severe and mild risk of exposure and the risk are to health and environment. The Health and Environmental Risk Perception Index was calculated to be 2.76 (undesirable condition).

In conclusion, the study shows that there is a significant relationship between the household size and the quantity of waste generated inherent in Bida Township ($r=.714 \leq p=.000$).

CONCLUSION AND RECOMMENDATIONS

Analysis of the aim and objectives of this study revealed that although the awareness level of different institutions and the community were at variance (good as perceived by the institutions, contrary is the case for the residents of Bida Township).The present circumstances of municipal solid waste management system in Bida town do not provide adequate concern about the environmental impact of the act. The poor awareness of the

community, absence of scientific and sufficient disposal systems, the less attention given for environmental protection and attitude of the residents to municipal solid waste management practices limits the awareness of the community and, for management of solid wastes of the town to stand against getting scientific and modern. The recommendations include:

i. Waste management should primarily be focused at household level for sustainability and cost effectiveness and those elements which cannot be managed at the household level should be managed at the community level. Since the poor provision of the necessary facilities used for solid waste management system was one major cause for poor MSWM of the town, to achieve effective SWM at local level, Bida Local Government authority should provide those materials to enable the people change their poor MSWM practice in to environmentally sound ones.
ii. Also, the total municipal solid waste disposal sites that are available in the town were not cited in proper locations, adequate plans should be design to cater for management of MSW generated in the town based on the population.
iii. The collection and disposal sites form MSW should be properly studied by considering the existing land use, wind direction, topography and also distance from stream, in order to protect the environment from pollution and damages.
iv. Furthermore, awareness creation among the inhabitant of Bida town and key development policy makers and implementers at all levels regarding the advantages of SWM in urban areas and its potential advantages in environment and health protection, recycling and reuse of waste needs to be made.
v. In order to identify the rate and extent of environmental degradation due to poor MSWM practice, further researches should be conducted in the study area. Lastly, it is also essential to create appropriate partnership with local NGOs and private sectors to realize environmentally sound and effective MSWM system in Bida town.

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DEVELOPMENT CONTROL: A STRATEGY FOR FLOOD VULNERABILITY ASSESSMENT IN SULEJA

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Urban centres in developing countries are experiencing rapid urbanization. This is often associated with lots of problems which range from improper waste management, building contraventions, non-adherence to building standards, pollution, overcrowding and flooding. In curtailing these problems, development control tools are frequently used. Against this background, the effectiveness of development control tools was used to assess flood vulnerability in Suleja, Local Government Area of Niger state. In achieving the aim of this study, buildings vulnerable to flooding were identified; factors influencing flood vulnerability and the implication of non adherence to development control measures were also examined. The theory of urban resilience forms the basis for this study. Primary and secondary sources of data were used for this study. A total of 278 questionnaires were administered using multi-stage sampling techniques. A quick bird image of 15meter resolution was used to map out the vulnerable and contravening buildings in Suleja using a 15 meter setback from the river banks. The study reveals that 799 buildings contravened building standard in Suleja, while indiscriminate solid waste disposal was found as a strong factor influencing flood vulnerability in Suleja. The study also revealed that 47% of the drainages in Suleja are blocked with solid waste. The study recommends that solid waste in Suleja should be collected promptly and development control mechanisms should strictly be enforced by the Niger State Urban Development Board, Suleja.

Keywords: Building Standards, Development control, Flood, Solid Waste and Vulnerability

INTRODUCTION

It is no doubt that cities in the world are experiencing rapid urbanization. The alarming pace of the rapid urbanization experienced in these cities is often accompanied with lots of challenges, especially in cities of the developing countries where less regard is given to urban planning. Problems that arise from the rapid urbanization experienced in cities of the developing countries range from housing shortage, insanitation, inadequate infrastructures, crime, congestion, creation of slums and flooding (Kadi *et al.*,2012*;* Okorie, 2015). These problems are not far-fetched from the problems of rapid urbanization experienced in Suleja, Niger State. The quest for cheap housing/ property in Suleja has led to contraventions by developers, building on marginal lands, congestion and emergence of slums. This phenomenon often results in environmental problems such as indiscriminate solid waste disposal and flooding. In recent times these environmental problems have ravaged some communities in the country with Suleja inclusive. In July 2017, Suleja was wrecked by a devastating flood killing 18 persons and destroying properties worth millions of Naira. The raging flood was attributed to blockage of drainages by solid waste and erecting building along waterways (Warami, 2017). Expert believed that these obstructions (blockage of drainages by solid waste and buildings along waterways) will always keep the flood plain soil saturated with water and buildings erected along these channels will be vulnerable to flooding giving the slightest rise in water flow (Bwala *et al*, 2015). Contrary to this claim, urban planners opined that the raging flood in Suleja was man-made and can be linked to the deficiencies in the implementation and enforcement of the Nigeria Urban and Regional Planning laws (Onwubiko, 2017) which development control is a subset.

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Adeleye, (2018). **DEVELOPMENT CONTROL: A STRATEGY FOR FLOOD VULNERABILITY ASSESSMENT IN SULEJA.** Contemporary Issues and Sustainable Practices in the Built Environment. School of Environmental Technology Conference, SETIC, 2018

The Nigeria Urban and Regional Planning (1992) part two subsection 31(a) states that development should be rejected if not in accordance with an approved plan while subsection 31(e) of the same part stipulate that, any building that constitutes a nuisance to the inhabitants of the community or contains such additional facilities that are not within the estimation of the of the physical development plan for the community should not be approved by the planning authorities. This indicates that when development control tools are strictly enforced by planning authorities, buildings will not be erected on marginal lands or sited along waterways. Also skip bins will not be placed along drainage channels hence, reducing flood vulnerability. Development control is seen as a measure put in place by physical planning agencies to maintain standards which in turn will reduce the negative effects that accompany physical development (Obabori *et al*, 2007).

That is, development control measures aim at achieving a practical environment that will safe for working, recreating and living as envisaged by planning Utopias. Against this background, the effectiveness of development control measures was used to assess flood vulnerability in Suleja, Niger. This Study assesses the effectiveness of development control measure in flood vulnerability assessment. To achieve this assessment, buildings vulnerable to flooding were identified. Factors influencing flood vulnerability and the implication of non adherence to development control measure were also examined.

Study Area

Suleja Local Government Area (fig 1) lies between latitude 9º6’13.8’’ and 9º17’49.35’’ north of the equator and longitude 7º6’58.6’ and 7º12’18.41’ east of Greenwich Meridians. Suleja local government has a population of 216,578 with 10 political wards (NPC, 2006). The strategic location of Suleja has had the most profound effect on its development and its potential growth in the near future.

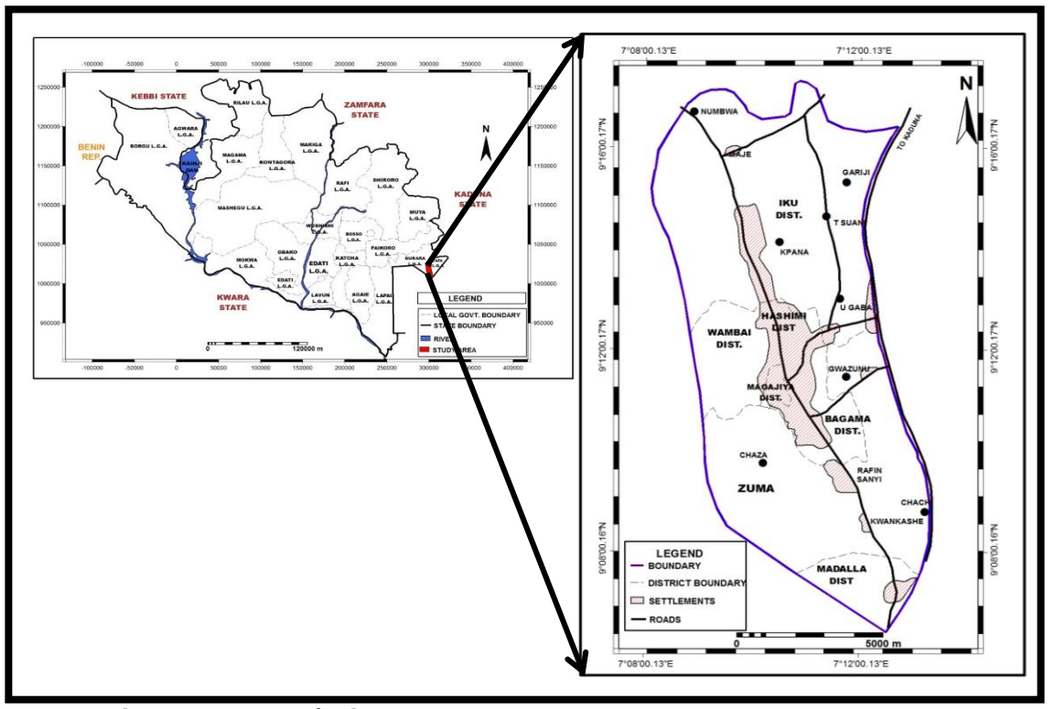

Figure 1: Administrative map of Suleja
Source: Department of Urban and Regional Planning Federal University of Technology, Minna

Theory of Urban Resilience

The word resilience originates from the Latin word "Resilio" meaning "to bounce back" (Meerow *et al*., 2016). The theory of resilience is complex, because the theory fosters multidisciplinary scientific collaboration (staart and Griesemer, 1989 in Meerow *et al*., 2016). In describing the relationship between living organisms and their natural or developed environment the theory of resilience was first used Crawford Holling in 1973. The theory by Holling defined the resilience of an ecosystem as the measure of its ability to absorb changes and still persist (McAslan, 2010). Relating the theory of resilience to urban research/urban setting, Meerow *et al*., (2016) refers to urban resilience as the ability of an urban system and all its constituent socio-ecological and socio-technical networks across temporal and spatial scales to maintain or rapidly returned to desired functions in the face of disturbance.

The theory of urban resilience provides a useful framework for understanding how communities, organisation and ecosystems cope in a changing world of uncertainties and challenges. This theory focuses on the interaction between periods of plodding change to sudden change and provides better understanding on how society should respond to disruptive events (McAslan, 2010). The theory of urban resilience stresses the need, for awareness, detection, recovery, provision of utilities and essential services during an emergency or crisis.

The theory of urban resilience when applied in Suleja would help stakeholders in been proactive in the area of preparing strategic operational plans and programs which addresses risk and vulnerability. The theory of urban resilience will help policy makers; academics, urban planners and other practioner in understand how disaster (both manmade and natural) and other disruptive challenges can better be addressed. Since the theory of urban resilience embraces the concept of awareness, detection and avoidance, the populace in Suleja would be better sensitized on the dangers of building along waterways and indiscriminate solid waste disposals most especially in drainages.

Application of Development control measures in combating flood vulnerability

The neglect of planning laws and land use regulations has led to the ineffective urban planning in the developing countries. This fact has made development control measure impotent in the developing world. According to Goodfellow (2013) the weaknesses of development control measures have made the prospects for alleviating the problems faced by the urban poor dwellers in the use of land very slim. Since independence, various Africa countries have recorded a long repetitious list of failure in efforts to regulating urban space because of the ineffectiveness of development control measures (Mabogunje, 1990 in Goodfellow, 2013). The ineffectiveness of development control measures in the developing countries can be attributed to lack of political will by the government in enforcing planning laws and the corrupt practises found among planning officers. This experience is also evident in Nigeria, corrupt practices among planning officers are most common especially among site inspectors who are some absent from duties without necessary permission also; the political interference from the power that be has also contributed to the inadequacy of development in Nigeria (Aluko, 2011).

The laxity in the implementation of development control measures has led to many environmental problems in Nigeria from time immemorial. These environmental problems range from the bubonic plague of the 1920s, littering of the environment with uncollected solid waste and incessant flooding experienced in various states of the federation. In recent times, the latter (Flooding) still continues to ravage communities in the country destroying lives and properties. In this regard, experts have recommended the physical planning approach which includes development control as a strategy to mitigate the incidence of flooding and flood vulnerability (Bwala, *et al.,* 2015). Similarly, the reports from Marrickville Council (2015) and Ashfield Council (2015) also assert that, the primary method of flood risk, vulnerability assessment is through the application of development control measures. These reports indicate that the application of development control measures will help to minimise impending damage to properties, risk to life and ensure that any existing flood affected area is not adversely by future development (Marrickville Council, 2015). The deduction from these reports shows that development control strategy is a laudable approach to flood vulnerability.

METHODOLOGY

Data for this study were gathered through the primary and secondary sources. To determine the buildings vulnerable to flooding and those contravening development control measures, high resolution satellite (quickbird) of 15 meter resolution was acquired through "terra incognita" application. Data on development control standards as regards the actual setbacks for rivers and canals were searched out from the planning permit platform of Nigeria. While data on development permit were acquired from the Niger State Urban Development Board, Suleja.

In examining the factors influencing flood vulnerability in Suleja, oral interview and questionnaire survey via open data kits were used to gather data. These primary data were backed up with data acquired from past research work on Suleja. In the same vein, the

primary (oral interview and questionnaire survey) and secondary data (research from past work) source were used to gather data on the implication of non adherence to development control measures in Suleja. The multi-stage sampling techniques were adopted for this research. Using this technique, each member of the population has an equal chance of being sampled. At the first stage the study area was alienated into 10 geographical entities based on the 10 political wards (Bagama "A", Bagama "B", Magajiya, Iku South I, Iku South II, Hashimi "A", Hashimi "B" Kurmi Sarki, Maje and Wambai). Each ward was divided into constituent neighbourhoods at the second stage. Thus, 44 non-overlapping neighbourhoods were identified as shown in Table 1. Major streets were identified out of the 44 neighbourhoods at the third stage.

Table 1: Sample Frame and Sample Size

S/N	Wards	No. of Neighbourhoods	No. of Streets	Sample Frame	Sample Size (0.1%)
1	Bagama "A"	5	27	26,602	27
2	Bagama "B"	4	25	24,710	25
3	Magajiya	4	26	25,780	26
4	Iku South I	5	30	30,181	30
5	Iku South II	5	32	31,757	32
6	Hashimi A	3	24	23,709	24
7	Hashimi B	4	29	28,892	29
8	Kurmin Sarki	5	31	27,036	27
9	Maje	4	27	28,601	27
10	Wambai	5	27	31,467	31
	Total	**44**	**278**	**278,735**	**278**

Source: Author's Field survey, 2017

Method of Data Analysis

On the Satellite image acquired, a buffer (setback) of 15 meters as approved by the Niger State Urban Development Board for rivers was created along the water channels in Suleja. This task was performed using the analysis tool in Arc toolbox on ArcGIS 10.2 software. Buildings that falls within the buffer line were also digitized on ArcGIS 10.2 and their actual numbers were determined on the attribute table created for the building. Data gathered through the open data kits were downloaded in excel format and these data were imported into JASP 0.8.0.0 software and a descriptive statistic was ran. The data generated were processed and tabulated.

RESULTS AND DISCUSSION

Flood vulnerability in Suleja

To determine the buildings vulnerable to flooding in Suleja a buffer/set back of 15meters as stipulated by the Niger State Urban Development Board was created along the river channels in Suleja. Buildings that fall within the buffer tend to be contravening the development control standards also these buildings are vulnerable to flooding. The analysis reveals that a total of 799 buildings were contravening the development control standards and at the same time vulnerable to flooding. The vulnerable/contravening buildings are represented in red colour as shown in Figure 1.

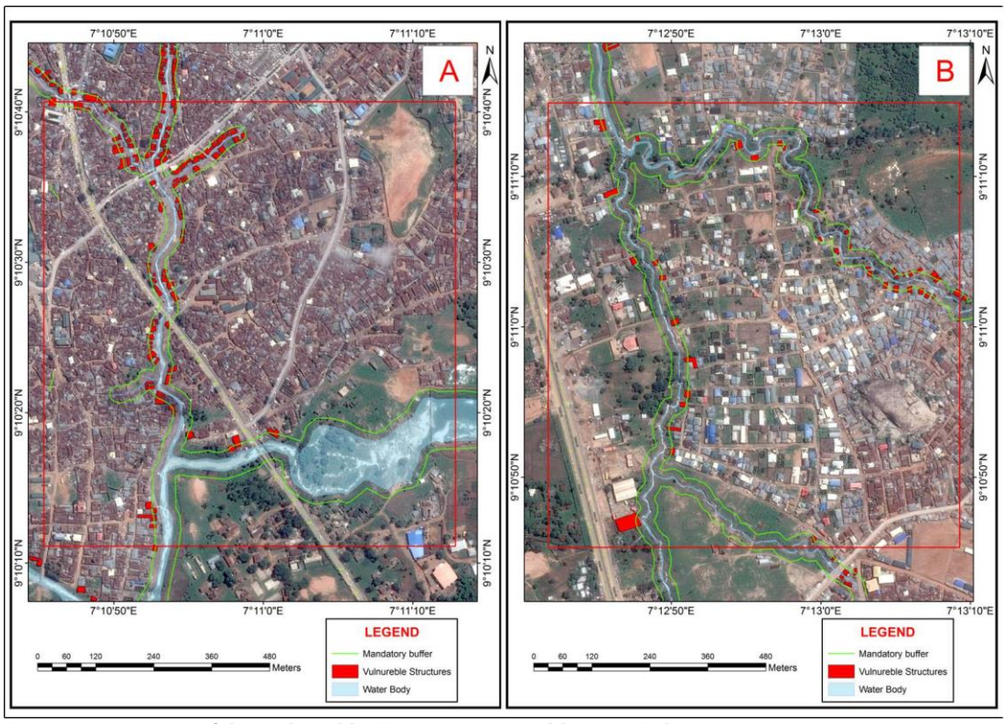

Figure 1: A section of the Vulnerable/Contravening Buildings in Suleja
Source: Author's Field Survey

The high number of contravening buildings in Suleja can be attributed to laxity in enforcing development control measures by the town planning inception officers and the bureaucracy involved in the approval of building plan by the Niger State Urban Development Board. According to the Board (NSUDB) only 35% of the building plans submitted to the board for approval were approved yearly. Between 1987 and 2015, only 932 building plans were approved by the Board (NSUDB) out of the 2656 plans submitted for approval (Adeleye, 2015). The inability of the Board (NSUDB) to approve more than 35% of the plans submitted often force developers to go ahead with their development without having their plans approved. This act encourages contravention and erection of buildings on marginal lands which in turn leads to flooding. Figure 2 shows a section of the vulnerability map of Suleja. The vulnerability areas in Suleja were classified into 3 that is, low risk area, moderate risk area and high risk areas. Low risk areas have a possibility of less than 3% chance of flood occurring, the moderate risk areas have a possibility of 50% - 90% of flood occurring while areas with high risk have a 90% chance of flood occurring in Suleja.

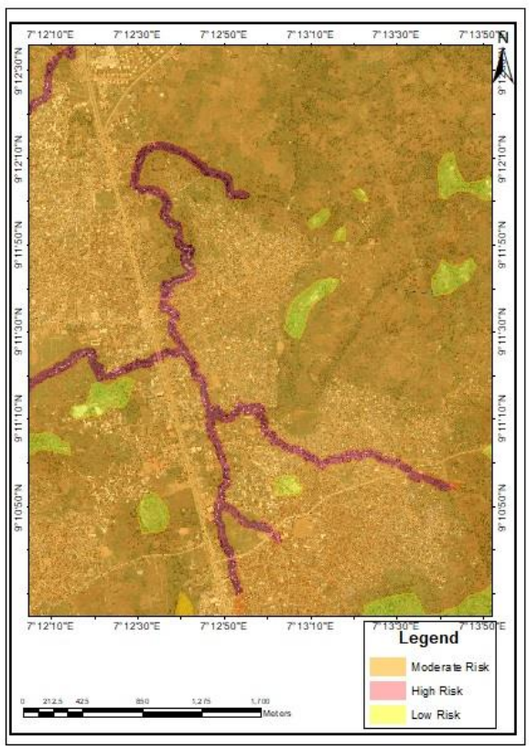

Figure 2: A section of the Vulnerability Map of Suleja
Source: Author's Field Survey, 2017

Factors influencing flood vulnerability in Suleja

Indiscriminate waste disposal in waterways, poor system, building on marginal lands, building along river banks and cultural belief were responsible for flood vulnerability in Suleja. Table 1 reveals that 43.5% of the respondents were of the view that indiscriminate waste disposal is a strong factor influencing flood vulnerability in Suleja; this claim was corroborated with field survey carried out. During the field survey, it was observed that uncollected solid waste littered the street and water channels in Suleja (see plate 1). A total of 308,940 cubic meters of Solid waste is said to be collected yearly in Suleja since 2013. But this statistic does not reflect the true record of solid waste collection in Suleja because solid waste is left uncollected daily in Suleja (Adeleye, 2015). This is a clear indication that indiscriminate solid waste disposal in Suleja is a menace that should be addressed with immediate urgency.

Table 2: Factors Influencing Flood Vulnerability in Suleja

Options	Frequency	Percentage
Indiscriminate Waste disposal in water ways	121	43.5
Poor Drainage System	50	18.0
Building on Marginal Lands	42	15.1
Building along River banks	63	22.7
Cultural Belief	2	0.7
Total	278	100

Source: Author's Field work 2017

Plate 1: Water Channel filled with soild waste in Suleja
Source: Author's Field Survey, 2017

Poor drainage systems were believed to influence flood vulnerability by 18.0% of the respondent (Table 1). Building on marginal lands was also seen as a factor influencing flooding by 15.1% of the respondents. However, 22.7% of the respondents were of the opinion that building along river banks influences, flood vulnerability in Suleja this assertion was also shared by Environ (2017) an online platform. Environ (2017) opined that the 2017 flooding in Suleja affected my people who built their houses along the river banks. Table 1 further shows that 0.7% of the respondents were of the view that Cultural belief were factor influencing flood vulnerability in Suleja. Those in this category were of the opinion that natural/manmade disaster is an act from God (Allah ne ya kawo).

Implication of Non Adherence to Development Control Measure in Suleja

The study revealed that emergence of slum, land degradation, flooding and poor accessibility are the effects of non-adherence to development control measures in Suleja. Table 2 reveals that 7.2% of the respondents were of the opinion that land degradation is an implication of non-adherence to development control measure in Suleja. This category of respondents believed that lands that ought to be conversed and those that should serve as carbon sink have either been converted or distorted because of the laxity in development control measures. Poor accessibility and Emergency of Slum was attributed to the implication of non-adherence to development control measures by 12.6% and 46.0% of the respondents respectively. The responses by the 46.0% of the respondents indicate that weakness in the enforcement of development control measure will lead to chaotic planning. Onwubiko (2017) also shared this belief and opined that houses in Suleja are mostly ramshackle,

associated with congestion as if there is a total absence of town planning authority in Suleja. The statement by Onwubiko (2017) is also an indication that development control measure is lacking.

Table 2: Effects of Non Adherence to Development Control measure in Suleja

Option	Frequency	Percentage
Land Degradation	20	7.2
Poor Accessibility	35	12.6
Emergence of Slum	128	46.0
Flooding	95	34.2
Total	278	100

Source: Author's Field work 2017

On the other hand, 34.2% of the respondents which is the second highest were of the opinion that flooding is an implication of non adherence to development control measures in Suleja. It is no doubt that hundreds of thousands of poor civil servants, petty traders and artisans who work in the Federal Capital Territory are resident in Suleja due to high cost of residential rents in the Abuja. The quest for cheap land and residential housing often force developers to build on any available space, be it Water channels or flood plains thus encouraging flooding. These findings can be attributed to the responses of the 34.2% respondents who believed that flooding is an implication of non adherence to development control measure.

CONCLUSION AND RECOMMENDATION

Buildings contravening development control laws should be marked and demolished as stipulated by the Town Planning Law of 1999, this Act will serve as a wakeup call to the public on the need to strictly adhere to development control measure. Inspection exercises by the planning officers should be on a regularly basis and planners should be cautioned on the dangers of bribery and other forms of indiscipline. This will help in effective management and planning of the Suleja.

The bureaucracy involved in building approval by the Niger State Urban development Board should be addressed by the Niger State government in order to have more plans approved as against the 15% benchmark set by the Ministry. This will encourage developers to always seek development permits and the rate of contravention will reduce.

The Niger State Environmental Protection Agency should sensitize the residents of Suleja on the dangers of indiscriminate Solid waste disposal especially in waterways. This will go a long way in avoiding the occurrence of flooding in years to come. Also more skip bins should be available and be properly sited by the Niger State Environmental Protection Agency (NSEPA). Further more Solid waste should be collected promptly by NSEPA.

To achieve an ideal city that will be practicable for living, working, and recreating, it is pertinent to fully enforce the development control measures amidst the rapid urbanization experienced in Suleja. This study has effectively identified the buildings contravening development measures and the implications of non adherence to development control measures.

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TOWARDS RESILIENT IN DESIGN AND CONSTRUCTION OF HOUSING IN COASTAL AREA OF LOKOJA, NIGERIA

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The plight of coastal communities cannot be overlooked due to their contribution to the national economy, in regard to agricultural activities, fish production and housing provision for huge riverine population. Residing in such communities is attributable to the love of the ocean front a well as the economic opportunities of the river, hence their future need to be secured. However, they are plagued with the problem of natural disasters, especially flooding that emanates from climate change. The building structures in these areas are submerged under flooding and the reason is because of poor architectural design and improper planning in recognition of climate change. Lokoja coastal communities are not an exception to this occurrence. The paper aims at highlighting various measures that can be adopted to reduce the impact of flooding on the built environment through resilience design. Resilient design is new form of sustainability which entails careful design to suite a particular situation. In an attempt to achieve this, relevant literatures, fields work and oral interviews were adopted. The findings revealed that 30% of the houses examined were in bad state and need urgent attention against flood event. It is also revealed that more than 50% of the houses were not flood aware designs and there is no proper regulation guiding new developments in this area. The paper concludes that coastal communities need to adopt more resilient design measures in other to withstand future risk of flood disaster and recommended that various resilience principles should be adopted in this area to mitigate against the risk of flooding on building structures.

***Keyword**: climate change, coastal area, resilient design,*

INTRODUCTION

The coastal area is associated with water bodies such as rivers, oceans, or seas. They are at risk of natural disaster (flooding, storm surge); which is connected to climate change, Climate change is seen to be change in weather condition on a particular region over a long term. Human settlement and social economic activity in urban area adjacent to shorelines, are becoming increasing, (Du Gommes et al. 1997; Brooks et al. 2006), since survey shows that 21% of the world population lives within the coastal zone, the potential impact of sea level is significant for the wider eco system (Kumar 2006). The increasing in urbanization and climatic change has posed a serious threat to housing and settlement, of which no proper measure has been put in place to address housing resilient against future risk or to build a long-term disaster resilient shelter, especially in a coastal community, Coastal flood are generally considered as the most dreadful natural disaster (Douben 2006), Over the period 1985 to 2014, poor urban planning ;design, materials and construction of building increase the vulnerability of riverine settlement to flooding (Anunobi, 2013), According to (Tran, 2014) the lack of communications among building professional_(architect and engineer)-is one of the major challenge facing the coastal community because they are generally a low income class, hence building construction are been carried out by themselves without technical guideline for it resilience against disaster. Flooding can be mitigated by improving community resilience. Many argue the need to balance environment and developmental issues while promoting safe and livable communities as the key to fostering resilience and this can only be done through hazard mitigation planning and managing local land use (Burby, Beatly, Kaiser, Paterson. 1999).

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Cutter 2004 is of the view that building resilience community required building codes, retrofitting homes, elevating homes, which are all measures that can enhance resilience as does the building of redundancy floor in some of the critical infrastructure. United Kingdom(Uk) based firm, Baca architect, establish a L*ife*project 2005 In the guide designing for flood risk, set out some set of principles; that is allowing water to fit the site, in a controlled and predetermine manner and creating opportunity for site option such as playground, renewable energy, play area and car parking. In this way the risk to flooding can be minimized. According to report on development guide for the resilience housing for Lake Macquarie, the researcher set out a set of principle for improving the resilient housing in coastal community that has the ability to deconstruct, relocate, appropriate site planning and protect and float. The study covered only the community along the flood plain of river Niger in lokoja kogi state these are area which are susceptible to flood event, therefore the aim is to identify the housing characteristic, construction techniques and the risk and vulnerability of housing in these area . And also to identifying various resilient building practice for housing in the coastal area.

Concept of Resilient Building

The term resilient was first use in 1970s in a field of ecology which describes a system to be able to maintain and recover after event of disturbance and is thus applicable to cities because they are in continuous adaption to change. The rocker feller foundation created a report on resilient framework in the report he outline five principles that are common with resilient systems: redundancy, robust, flexibility, integrated and inclusive. Thus, resilient idea allows the construction of building in a high risk sensitive area to function safely where other buildings will ordinary not survive. (Glies 2012). This implies the design of building with cost effectiveness to allow continuous uses of building overtime and adjusts to predicted rise in sea level over a certain period of time. Thus, adapting to be resilient will be the appropriate method for houses along the shoreline; it's reduced waste and retain community structure. Thus resilience has developed an idea with several definitions just like the term sustainability has over the year. In terms of liberating disaster, resilient implies transition of long-term scenario into a shorter and stable situation. According to the Resilient Design Institute (RDI), resilience is the ability to adapt to changing situation, regain and maintain functionality and strength during a distress situation or disturbance. Managing flood risk can aid innovation among communities stakeholders and professionals. This is possible when vulnerability is understood by all those involved.

Conceptualising Resilience in Relation to Vulnerability

In the study of natural hazards, resilience is taken to be related to vulnerability and to the recovery process after disasters (Tobin, 1999; Pelling, 2007; Klein, 2003; Wisner et al., 2006; United Nation/International Strategy For Disaster Reduction, 2009). It encompasses coping strategies as well as the post-event adaptive capacity of a social system (Cutter et al., 2008). Adaptive capacity in this context is considered as the ability of individuals or households to survive soon after a stressful event and to make a long-term sustainable adjustment (Smit and Wandel, 2006). It bears a similarity to coping strategies in the face of hazard impacts (Turner et al., 2003; Gallopin, 2006).

In conceptualising resilience, it is necessary to differentiate between the coping capacities of fragile societies that are unable to cope and those that are capable of recovering on their own (Gaillard, 2007). As regards fragile societies, hazards resulting from environmental degradation deprive them of their main resources and push them to rely on external resources in order to recover. Other factors that are known to influence resilience in fragile societies during recovery are their degree of vulnerability and the nature of the hazard. These factors vary significantly in time and space and from one disaster to another. For example, the resilience of the community struck by the 2004 Tsunami in Thailand for the first time was different from that of communities who are used to experiencing frequent climate-related catastrophes such as cyclones (Schroeder and Yocum, 2006), implying that resilience is hazard-specific. Resilient in respond to vulnerability can then be mainly hinged on soil, environmental, economical factors. Others may be institutional and psychological. This study focuses more on environmental factors.

Table 1: Types of Resilience

Type of Resilience	Variables
Social resilience	Household characteristics, flood experience, flood characteristics, living with flood risk and coping
Economic resilience	Property ownership, socio-economic status, loss of belongings
Infrastructural /Environmental resilience	House type, access to services, built environment, land use, state of built environment after flood
Institutional resilience	Engagement with local and national institutions and agencies for flood recovery; role of science and technology, communication, assistance, governance
Psychological resilience	Anxiety about diseases, living with flood trauma, stress and uncertainties about the future
Community competence	Living with flood risk, neighborhood relationship, values and beliefs, local knowledge on flood, wellness, quality of life

Source: Adapted from Cutter et al., 2008; Schelfaut et al., 2011, Cannon, 2008; Norris, et al., 2008

Practice and Theory of Resilient Building.

There is need to recognize resilient housing that adopt the concept of adaptability and flexibility thereby allowing occupant of building to accommodate family change through environmental factor that is rise in sea level. A Dutch architect in 1960 laid down a set of principle on 'support' that is a system where the building base or support is differentiated from interior fitting in construction of residential. Several countries around the globe had been implementing the concept of resilient housing for decade example are seen in United States and Netherlands where floating house are constructed to cope with flood event, like wise in New Zealand where relocating house are most use. Example of several international research base projects on improving adaptability and the idea of living with water include life project, floatable houses and storey home.

The Life Project

A UK base architectural firm, Baca architect establishes a *liFe* (Long-term Initiative for Flood risk Environment) project in 2005, with the aim of finding ways to tackle the rising effect of climate change. The concept allows water into the site in a controlled and predetermines way, while providing option for other site features such as playing ground, play area, renewable energy and car parking. The life project features the following set of principles for adaptability and development:

- Create space for the river

  Create space to direct flood water away from dwelling and protect floodplain from washing up by flood water.

- Create space for energy

  Create space on site where possible for wind turbine or solar panel on the roof for efficient renewable power generation.

- Provide space for rain

  Space that can store rain water for considerable time, thus slowdown surface water runoff and prevent floodplain from flooding.

- Integrate with community requirement

  A proposal that will address the community need base on the area which they are lacking in terms of social amenities provision.

- Provide back-ups

  A design with higher resiliency that provide reservation, like "safe haven building".

- Design to be adaptable

  A retrofitdesign that will adhere to resilient measure, space that will accommodate for future flood, (Baca Architect, 2013).

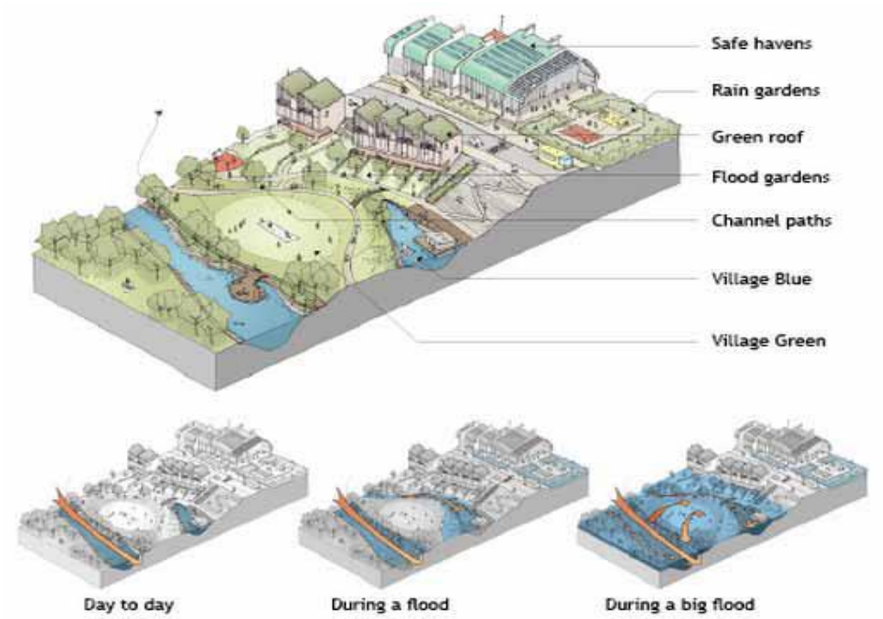


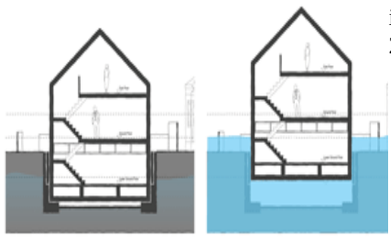
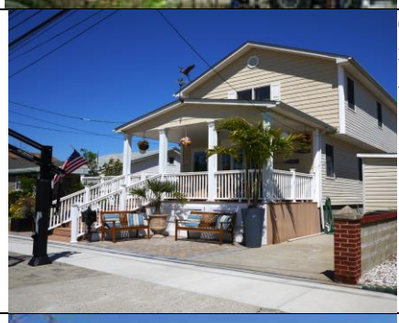
Figure 1: Baca architecture life project principles, indicating community outlook during and after flooding. *Source: Google image*, (2016).

From the case studies in literature so far, it becomes evident that flood resilience can be best achieved in existing building through retrofitting, policy making and finally guiding principles. Therefore these principles can be used to assess the study area based on people's perception to know which of these resilient approaches will be appropriate in the study area. Form the existing principles resilient building measures can be grouped into two major categories; the wet proofing or water inclusion strategies which entail allowing water to the enter the building but the structural integrality will not be challenge while using building materials that facility drying these are seen in Baca architect amphibious house. Dry proofing or water exclusion strategy this prevent water from entering structure and water resistance material are often use in such situation example are seen in the elevated home. In summary the resilient housing incorporates the following features

- Building redundancy floor -storey building (wet proofing).
- Elevated home (dry proofing).
- Reinforce foundation/floatable(wet and dry proofing)
- Appropriate site planning and protection works(dry proofing)

Flood damage resistance materials (dry proofing)

Tables 2: example of resilient buildings

	Principle/concept	Images	source
1. Architect: baca architect Project tittle: amphibious house Year of completion: 2013 Location: United Kindom	Bouyance		Google image, 2016.
2. Architect: Adeyemi Project tittle: makoko school Year of completion: Location:lagos, nigeria	Bouyance		Google image, 2016.
3. Architect: Project tittle: Year of completion: Location:	Modable and relocating house		modable,2013.
4. Architect: Project tittle: Year of completion: Location:	**Raised Floor Height**		Google image, 2016.
5. Architect: Project tittle: Year of completion: Location:	**Storey Home With In-Built Redundancy Floor**		Google image, 2016.

The Study Area

Lokoja, the study area is located between latitude 7º45´27.56´N and 7º51´04.34´´N and longitude 6º41´55.64´E and 6º45´36.58´´E, with a total land area of 29,833km2. It shares political boundaries with Niger, Kwara, Nassarawa States respectively and the Federal Capital Territory to the North; Benue State to the East; Adavi and Okehi Local Government Areas by the South and Kabba Bunu (LGA) by West.

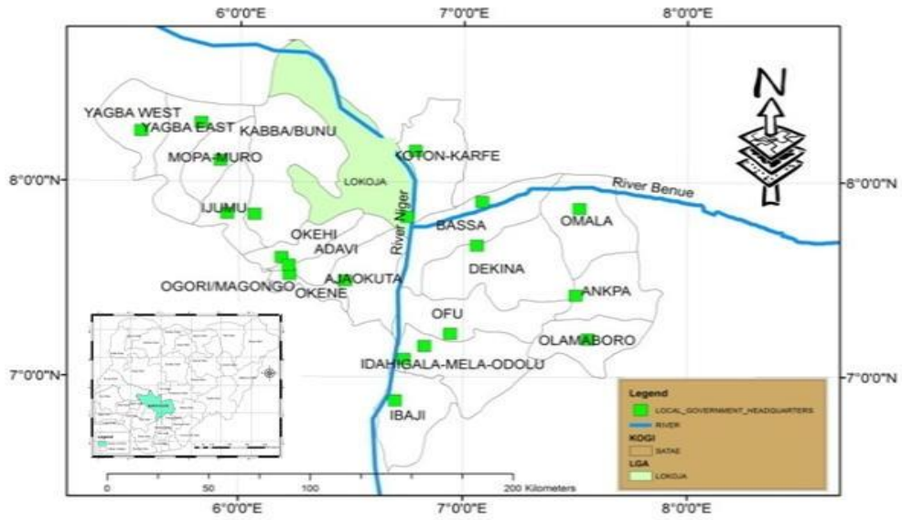


Figure2: map of Lokoja

The Study Area Coverage (Lokoja) Kogi State, Nigeria

The annual rainfall in the area is between 1000 mm and 1500 mm with its mean annual temperature not falling below 27oC. The Onset of rains is March/April and Cessation is late October. The rest of the months; November to March is dry. The general relief is undulating and characterized by high hills. The Niger-Benue trough is a Y-shaped lowland area which divides the sub-humid zone into three parts. The land rises from about 300 meters along the Niger - Benue Confluence, gradually reaching up to 600 meters above the sea level in the uplands. Lokoja is drained by Rivers Niger and Benue and their tributaries. It has been deeply dissected by erosion into tabular hills separated by river valleys. The flood plains of the Niger and Benue river valleys at Lokoja, is made up of hydromorphic soils which is a mixture of coarse alluvial and colloidal deposits. The alluvial soils along the valleys of the rivers are sandy, while the adjoining lateritic soils are deeply weathered and grey or reddish in color. The soils are generally characterized by a sandy surface horizon overlying a weakly structured clay accumulation.

Rainfall pattern in Lokoja

The rain pattern in Lokoja last between April to October, the state usually recoded highest pick of between September with annual rain fall of 1061 to 1524mm the table show the pattern of rain distribution recoded.

Table 3: Annual Rainfall Pattern in Lokoja

Year(s)	April	May	June	July	August	September	October	Average
2006	75.3mm	126.2mm	192.5mm	234.5mm	283.8mm	212.6mm	231.4mm	193.76mm
2007	82.3mm	277.3mm	184.5mm	231.5mm	225.0mm	246.0mm	240.7mm	212.47mm
2008	163.6mm	161.6mm	166.6mm	215.8mm	274.7mm	170.2mm	87.8mm	177.19mm
2009	243.6mm	108.3mm	220.1mm	212.8mm	369.8mm	255.8mm	206.4mm	230.97mm
2010	132.8mm	125.0mm	104.4mm	255.6mm	133.2mm	148.2mm	167.3mm	152.36mm
2011	65.7mm	147.3mm	163.2mm	128.0mm	150.9mm	191.1mm	147.9mm	142.01mm
2012	86.2mm	253.7mm	157.7mm	263.2mm	180.6mm	1448.4mm	209.9mm	371.39mm
2013	67.5mm	98.1mm	181.0mm	201.0mm	175.5mm	282.9mm	170.7mm	168.1mm
2014	76.4mm	151.4mm	161.8mm	241.3mm	184.2mm	240.3mm	200.1mm	179.36mm
2015	111.9mm	230.6mm	134.4mm	267.2mm	191.3mm	948.4mm	205.4mm	298.46mm

Source: Lokoja metrological center. 2015

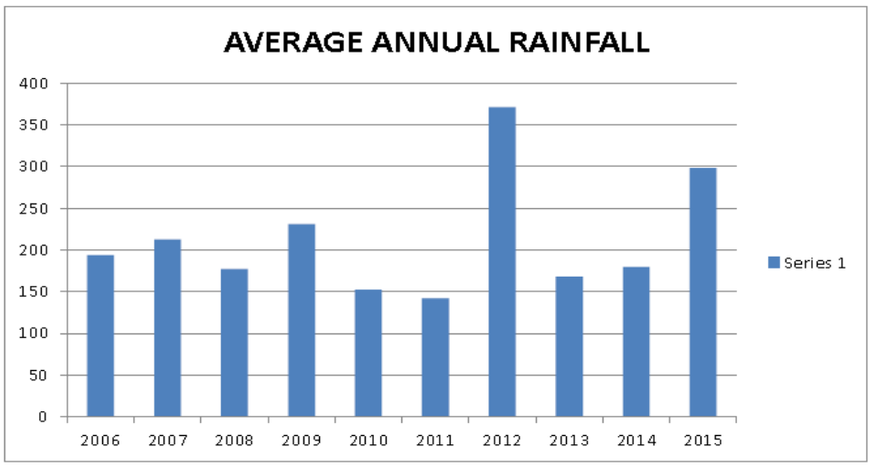


Figure 3: Annual rainfall distribution in Lokoja
Source: Lokoja metrological center. 2015

METHODOLOGY

The research adopted the uses of primary and secondary data collection which was field survey and administration of questionnaire, and online images respectively. The questionnaire was structured to achieve the stated objectives, a closer question was asked to get the user's need and perception in the selected community, this is achieved by the help of a trained personnel in the administering the questionnaire to each household of the community. In an attempt to examine housing resilient in the study area, nine(4) out of twenty-one(21) local government area in kogi state are vulnerable to flooding, convenient sample techniques was used to select the three closet local government to river Niger, three(3) out of nine were sample which are sarki-noma(lokoja), ozahi(koton-karfe), and ayanak(ibaji), the sample size is household head by types, this is divided in five types of units; single room, flat duplex, traditional compound, this is also narrowed to type of tenure. According to National Bureau of Statistics (NBS) general house hold survey 2004-2008 pg2 the average house hold size in kogi state is 3.6%. 3.6% of total population of 128,129 of sarki-noma which amount to 35,500 household head size and this paper focuse only on ownership occupier, 0.5% of 35,500 according nbs2004-2008 which amount to 17,750 sample frames were considered, in sarki-noma and case of 150 sample size representing 38% of population was spread randomly across the study area. A total of 150 questionnaires were administered and 83 was retrieve from the responded, totaling 55% of the questionnaire administered the building conditions in those areas were examined and their coping strategies were also assessed using a variable check list and structured questionnaire.

(a) Housing characteristics in this research work entail the following:

(i) Building type- this is general building typology such as bungalow, terrace building, row house, duplexes, multiplex, and so on.

(ii) The condition of building- the assessment will be based on the building the whole building component, especially the super structure which include the roof, external wall, window, and doors. a building will be considered 'Good' if all the super structure is free of defect, it will be considered 'Fair' if one of the component is faulty and is 'Bad' if the component has defect for instance cracking in the wall.

(iii) Building materials-the external wall materials will be considered.

DATA PRESENTATION AND DISCUSSION

Case Study One- Sarki-Noma

Sarki-Noma is one a local government council in Lokoja is one of the communities that suffer from menace of flooding annually. It lies within zone B in the flood vulnerability map, this zone is considered to be moderately vulnerable because of it close proximity to river see figure 4.

FIGURE 4: Google image of Sarki-Noma community
Source: google image (2016).

Figure 5 show the building type in the study area, from the analysis 44% of the building in the study area are bungalow, while 27% of building are traditional compound, 16% made up the duplex and 13% are semidetached building, this indicate the predominate building type in Sarki-Noma is bungalow.

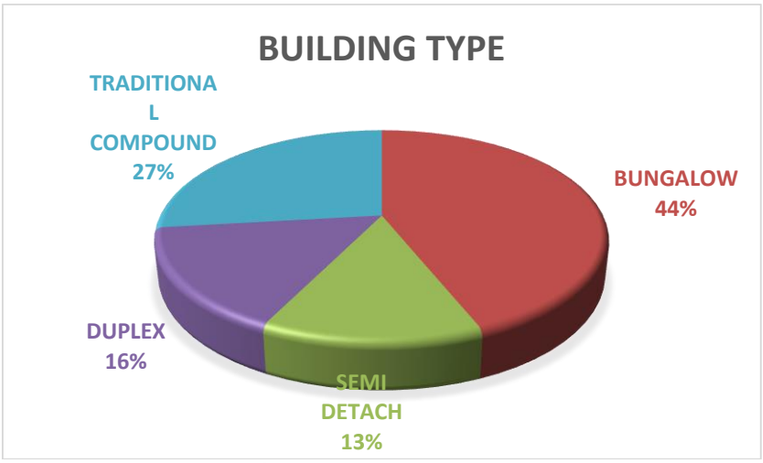


Figure 5: building type in Sarki-Noma
Source: Author field survey (2016).

Analysis of the bar chart in figure 6 indicate that 30% of the building are in a bad state, 45% of the house examine was considered fair and 25% of the house are in a good sate. This imply that those in bad state may not stand a chance of withstand flood water as it structural member are weak.

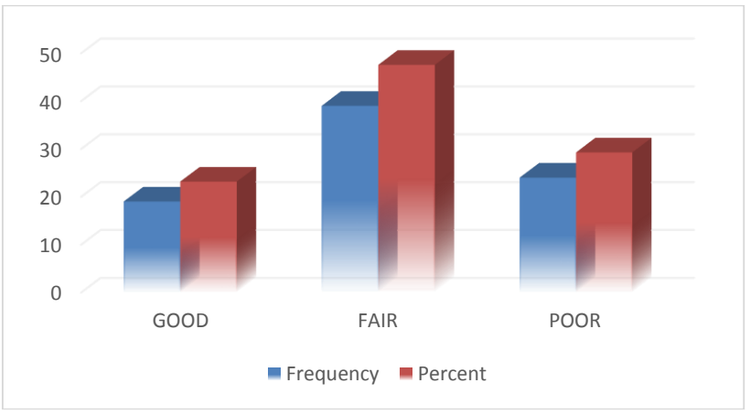


Figure 6: condition of building in Sarki-Noma
Source: author field survey (2016).

Figure 7: building type in the study area Source: author field survey (2016)

Case Study two- Ozahi

The region is bordered in the west by river Niger, name derived from abundant deposited of iron ore by Hausas, history has it that they are one of the oldest kingdom spanning over decade. The community around shore line of river Niger had lost properties worth millions of naira, from dredging of river Niger, washing aware the farmland, pond.

Figure 7: building type in the study area

Source: author field survey (2016).

Table 4: Building Wall Materials

Items	Bricks	Mud	Sandcrete Block	Bamboo/Straw	Timber	Total
Sari-Noma	✓	✓	✓	✓	✓	2
Ozahi	✓	✓	✓	✓	✓	2
Ayanak	✓	✓	✓	✓	✓	1

Source: Author's Field Survey (2016)

Table 5: Floor Materials

Items	Terrazzo	Wood/Plank	Mosaic Tiles	Brick/Lime Stone	Timber	Total
Sari-Noma	✓	✓	✓	✓	✓	1
Ozahi	✓	✓	✓	✓	✓	1
Ayanak	✓	✓	✓	✓	✓	1
Total	3	0	1	0	0	3

Source: Author's Field Survey (2016).

Table 6: Roof Materials

Items	Thatch/Bamboo	Aluminum/Zinc	Mud	Deck	Other	Total
Sari-Noma	✓	✓	✓	✓	✓	1
Ozahi	✓	✓	✓	✓	✓	1
Ayanak	✓	✓	✓	✓	✓	1
Total	3	0	0	0	0	3

Source: Author's Field Survey (2016).

Social economic survey- this entails the mode of living, the income level, occupation and the religion background of the respondent. The analysis of the table below show the general social demographic characteristic of the sample area, 67% of the respondents are male while 32.9% are female this is an indication that the majority of the households head are male, the

table 1 analysis also indicate that the sample community are not well learned only 12% of the populace attained tertiary education level and 21% attained OND, the implication is that this community is not well informed about innovation in terms of infrastructures since education play a very vital role in developing any society.

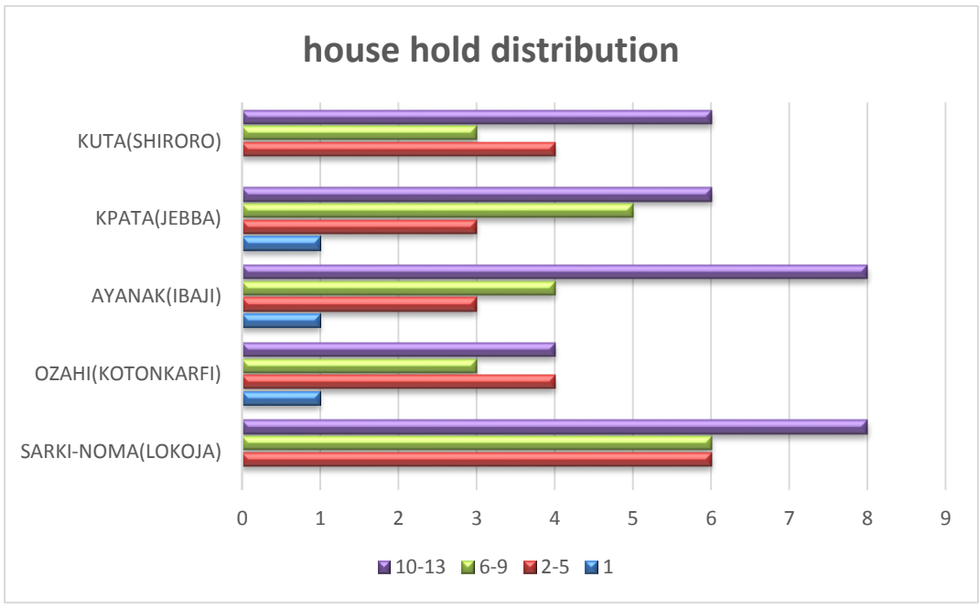


Figure 9: House Hold Size Distribution: Source: Author's Field Work (2016).

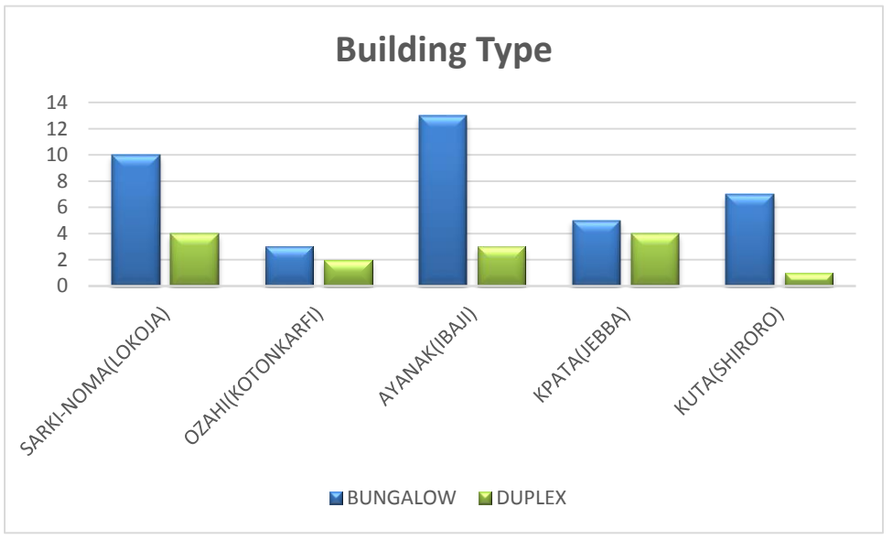


Figure 10: Building type Distribution: Source: Author's Field Work (2016).

it was observed among all the four community selected, Ozahi has the highest number of single story and tradition compound, never the less the settlement pattern are similar in those community, it was observe from the study that the responded live with their relatives in a big traditional compound while some who has the money like to build their house close to each other this is the general practice adopted by these communities see figure 4.2.

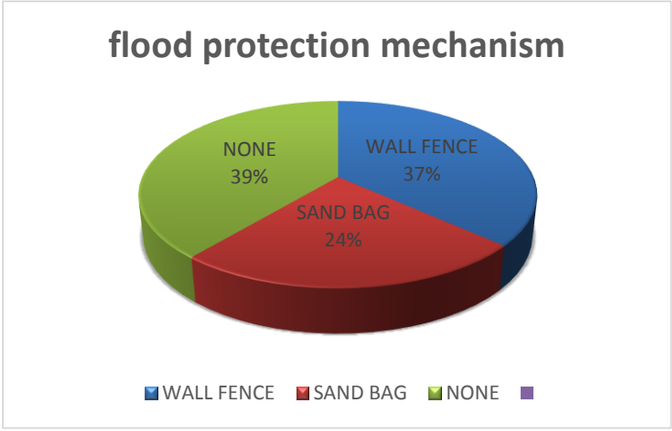


Figure 11: Means of Flood Protection: Source: Author's Field Work (2016).

The study also revealed that 37% of the residence use wall fence as flood defense bearer the problem with fence wall is that it can collapse and put adjoining property to risk if there is no flood vent that can aid passage of water while 24% use sandbag and 39% practically has no means of flood defense, this is an indication that the selected community is still in danger against future flood disaster.

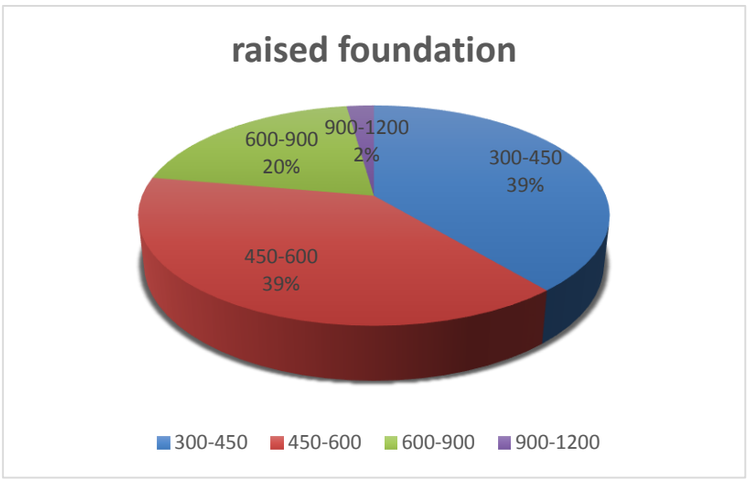


Figure 12: Height of foundation: Source: Author's Field Work (2016).

From figure 4.3 show that the 20% of the respondent raised their foundation up to 900mm height, 39% leave their foundation level at up to 450mm high also 39% have their foundation raised up to 600mm high while only 2% with a raised foundation of 900-1200mm, the consequence is that for being in flood plain foundation is ought to be raised to a considerable level so that floodwater cannot easily enter the building during minor or big flood.

CONCLUSION AND RECOMMENDATION

From the study conducted in the three communities, it become very clear that the present practice will not support the future risk flooding, study show that measures put in place is not adequate enough to help checkmate flooding, from the study the majority of the street lack drainage system, this is are also as a result of improper planning of the community, the study also revealed that larger percentage of the populace has their foundation lowered to the ground even minor flood can penetrate through. It is evident that those community are not well informed in terms of design and construction approaches against flood disaster, although the analysis also indicate they still possess some level of preparedness but measures are not enough against future flood disaster, therefore with increase in the global warming and climate change, it is alarming that some of this community still need to be reinforce to be able to mitigate the effect of this change. By exploring various means of flood protection method. However is it highly recommended to adopt the principle of resilient building design and construction to prepared the community against the future risk of disaster, through proper uses of building material, improved method of construction and design, proper site planning and also guiding rule from agencies such as National Emergence Management Agency(NEMA), Nigeria Hydrological institute Service (NIHS) for any new development

around a river bank and local community as well play a very vital role in achieving a resilient construction.

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PREFERENCE AND COMPATIBILITY: AGEING IN PLACE LIMITATIONS IN NIGERIA

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Studies have shown that interest of sourcing for better living reduces with growing preference of staying put at same locality as a person grows older. Meanwhile, the peculiarity of ageing process could necessitate the need for modification and/or relocation within the spatial configuration of the house. This study assessed the living standard of the old people by investigating the effect of progressive ageing on the indoor space syntax in Akure core residential area. This was done to ascertain if the preference is in tandem with the concept of ageing in place in Nigeria. Data were collected through structured interview aided by a voice-activated tape recorder to record each respondents' responses. The data collected were then transcribed alongside the observation notes. Descriptive statistic was used to process the data obtained from the close-ended questions and content analysis for the open-ended questions; which were categorised according to their similarity for corollaries The result revealed a contrast between aged preference and the idea of ageing in place concept in Nigeria. The need for regular evaluation performance was proposed among many others.

Keywords: *Ageing in place, Indoor space, Nigeria, Old people*

INTRODUCTION

Ageing in place policy involves providing an age-friendly environment suitable to support older people to live actively and independently, a practice that has been enormously embraced in the developed countries to tackle ageing issues (DCLG, 2008; Wiles et al, 2011). It is a policy where preference is complimented by compatibility. This policy was formulated due to the growing interest of old people to remain in same locality throughout their stay in life. Some of the possible reasons why old people may prefer to remain in same locality could be long neighbourhood familiarization that has resulted in space attachment, family structure, or personal challenges (Wiles et al, 2009).

The world became smaller and the geographical scope of coverage works inversely as people increase in age, thereby affecting the carrying out of their daily activities (Shaw *et al.,* 2007; Oh et al, 2009). As people grow older, they experience frail in strength and agility which are sometimes made worse by physical and health challenges (Okojie, 2010). Thus, eventually result in the need for some form of care, assistance and sometimes special attention from their families to carry out daily functions (Onanuga et al, 2016).

However, recent studies have shown that most of these old people live alone due to fiscal challenges. The children are that supposed to care for them have gone out of nest in search for better economic advantages, educational opportunities, and diversity of experiences (Omokaro et al, 2011; Onanuga et al, 2016). In return, living has become challenging as these old people have by their conditions depended solely on the neighbourhood and the house indoor space configuration rather make them more dependent.

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Familiarity caused by consistent lifestyle over time to augment a challenge could cause old people to rather prefer staying at their present dwelling, and this could have been misinterpreted as they rather enjoying the space. In another word, the old people may not like where they live but be contented since they have mastered the environment to reduce their level of dependency. Thus, this study investigates the living condition of the aged in Akure to understand the reason for their preference for continuous residence in the same locality and how compatible is their housing situation to successful ageing.

REVIEW OF LITERATURE

The preference to age in place by old people led to widespread adoption of 'ageing in place' policies in most advanced countries (DCLG, 2008). An age-friendly environment has been identified as the aiding force to ageing in place as it supports older people to live actively and independently in their immediate communities. The idea of age-friendly communities was developed by the World Health Organization through the Global Age-Friendly Cities Project launched in 33 cities in 2005 (WHO, 2007).

It focuses on enabling active and healthy ageing by improving the age-friendliness of physical (transport, outdoor spaces and buildings) and social (social participation, communication and information, community support and health services) environments in communities (WHO, 2002; WHO, 2007).

The wellbeing and independence at old age are associated with how active the aged maintain their usual lifestyle in the environment. Inclining with the understanding of activity and continuity theories, it ascertains that optimal ageing involves staying active and managing to resist the contraction from the society through a continuous life pattern across a lifetime (Neugarten, Havighurst, and Tobin, 1961; Havighurst, 1972; Atchley, 1989).

This continuity and the connection to the past are maintained through a furtherance of well-established habits, values and interests that are integral to the present lifestyle in the physical environment lived in. Therefore, ability of an environment to support continuous lifestyle could inform the wish to stay permanently in a locality.

Studies have shown that the challenge posed by the building indoor design at old age has been augmented through family support in fulfilling some of the daily activities (Gilleard, 2007; Golant, 2008; Onanuga et al, 2016). Since the children have flown off the nest, there could be constraint and difficulties in the navigation within the indoor space the aged lives due to the challenges associated with ageing. For instance, there is always increasing sensitivity to the level of indoor illumination, the height of a floor riser, proximity to spaces, among others at old age, which may not have been a subject of concerns at an earlier age.

Thus, it sometime becomes important to also adjust the indoor space syntax to reconcile the disparity between the aged present need and the indoor space arrangement. These adjustments may take different forms, including the revision of housing needs and aspirations or improvement of housing conditions through housing transformation or residential mobility that brings housing into conformity with users' aspirations or needs (Mohit et al., 2010; Aduwo, et al, 2013).

Staying in same locality may also not be a wish, the old aged may be stuck in the locality due to different challenges such as financial incapacity, neglect by family, or health challenges to mention a few. Since the old peoples' preference to stay in same house and or locality could have conceived several assumptions, there is need for investigation that will unveil the true perspective of the aged in Nigeria, hence this study.

METHODOLOGY

An interview that follows a structured questionnaire was adopted to source information from the respondents. The structured questionnaire was in two sections as some of the questions required response to options, while detailed explanations were required for some others. The section with close-ended questions was used to explore the socio-economic characteristics of the respondents and the section with the open-ended question was used to extract information as regards the salient objectives of the study. The study also adopted the review of relevant literature which allowed for an in-depth knowledge of factors underpinning respondent's views to give credible and valid results.

The study was carried out at the core residential areas of Akure, comprising: Isolo, Kajola, Ijomu, Odo-Ikoyi, Oshodi, and Araromi communities (as indicated with red line on the map in figure 1). Akure is the state capital of Ondo in the South Western zone, one of the six geopolitical zones which make up Nigeria. Akure is the economic nerve centre of Ondo State and a leading producer of mineral resources and food crops in Nigeria. It is located on the intersections of Latitude 7° 15' N and Longitude 5° 15' E. (Fig 1).

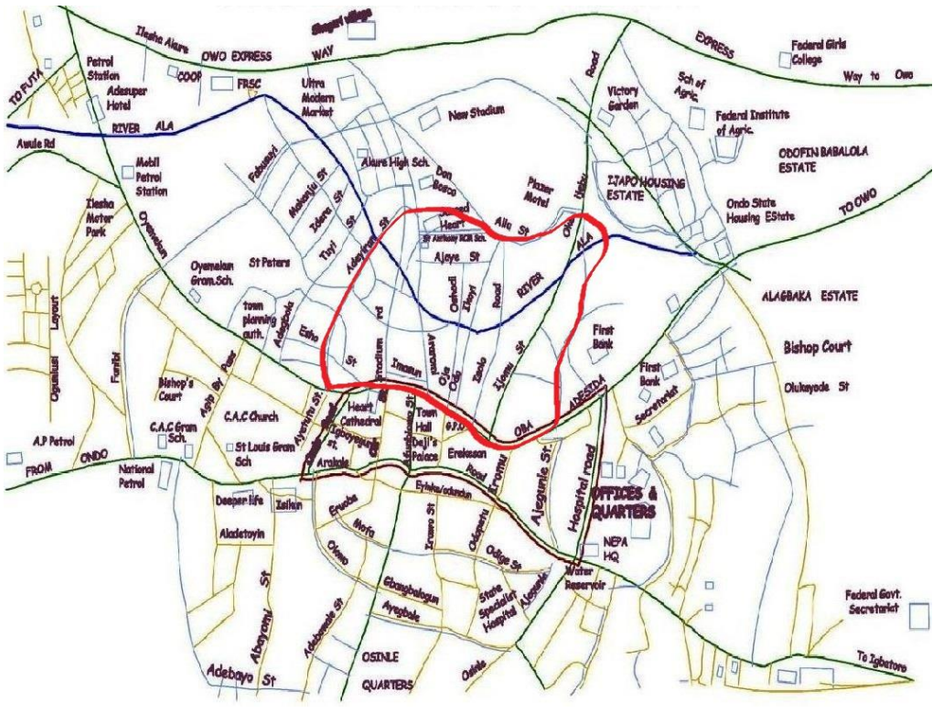

Figure 1: Map of Akure showing the study area
Source: Ondo State Ministry of Lands and Housing, Akure; 2010

All the interviews took place in the residents' homes. Observations of the participant, the activities, the setting for interviews and their expressions were utilised. A voice-activated tape recorder was also used to record each resident's answers so as to capture all the responses. The data was then transcribed along with observation notes. The structured questions encapsulate the participants living condition and wellbeing. Subsequently, a descriptive statistic was used to process the data obtained from the close-ended questions and content analysis for the open-ended questions which were categorised according to their similarity for corollaries.

The residential apartment that houses older adults aged at least sixty years (60 years) within the communities in Akure were targeted. All the streets within the study area were sampled. From the reconnaissance survey, the total number of the apartments housing the older adult aged at least sixty years was ninety-eight (98) buildings. All residents aged at least 60 years in the selected buildings were approached for an interview and 70% of them agreed to be interviewed. Each interview lasted an average of fifteen minutes (15 minutes).

RESULT AND DISCUSSION

Typical of the respondents

Majority of the respondents are indigenes of Ondo state and where also brought up in the locality. Some of the respondents keeps social contact with the world around them through the attached kiosk or shop at the front of their houses. Most of them are not educated, although very few of them still understand a little of English-based pidgin and creole language spoken as a lingua franca across Nigeria. Therefore, the local dialect was used as means of communication to all the respondents.

Demographic statistics of the respondents

Table 1 shows the summary of the background information about the respondents. There were more female (62%) than male (33%) adult in the study area. It was also observed from the table that 32% of the respondents resided alone, while 28% resided either with their

spouse or with their extended family. The age distribution of the respondents revealed that majority (78%) were aged more than 65 years, and only 22% were aged between 60 and 65 years.

The respondents' tenure status indicated that only 30% were owner occupiers, 48% were residing in a family house owned by either their spouse's parents (comprising mostly female respondents) or owned by their extended family; while 16% were renters.

Table 1: *Demographic detail of the Aged interviewed in the study area*

Variables	**Frequency**	**percentage**
Gender		
Male	19	38
Female	31	62
Total	50	100
Age		
55-65	11	22
66-75	11	22
76-85	15	30
Above 85	13	26
Total	50	100
Household structure		
Alone	16	32
With spouse	14	28
With adult child	06	12
With family	14	28
Total	50	100
House ownership		
Respondent	15	30
Family house	24	48
Adult child	03	06
Rented	08	16
Total	50	100
Impairment		
Bad sight	03	06
Bad sight/disable	17	34
Bad sight/morbidity	15	30
None	15	30
Total	50	100

Source: Field survey, 2016

The house structure and its' state of liveability

It was observed that majority of the residential apartments in the study area were old with 80% of the buildings needing one level of repair or the other (see plates 1, 2 and 3). Table 2 revealed all (100%) sampled buildings were tenement buildings, which usually consists of unit rooms adjoining both sides of a connecting passage, with shared unit kitchens and toilets at the rear. The kitchen and the toilet could either be attached to the building or detached from the building. Since the majority of the population are in the low-income category, they live in tenement properties because of its low rent, though many of such properties lack basic infrastructure. Even the house owners only do occupy two room from like ten (10) to twelve (12) rooms the building usually contain, depending on the design. Other room spaces are mostly let out to generate income. The quality of the housing in the study area is quite low in terms of building materials used, planning standard and construction technology (see plate 1, 2, and 3).

Plate 1

Plate 2

Plate 3

The common type of toilet facilities at the core is pit latrine built side by side with the kitchen space (see plates 2&3). This suggests that the aged in the study area live in housing condition that is characterised by overcrowding, unhygienic and building with a structural defect.

The condition of the buildings the aged reside in can, therefore, be said to have a relatively low habitability, which has direct effects on their state of health, socio-economic well-being and emotional stability. Consequently, having the majority of the respondents not satisfied with their living status in table 2 is expected, as 54% of them indicated that they feel rather "stuck in place."

Table 2: Building condition

Variables	**Frequency**	**percentage**
Dwelling type		
Bungalow	31	62
Storey	19	38
Total	50	100
Building type		
Tenement	50	100
Studio	--	--
Two bedroom	--	--
More than 2 bedroom	--	--
Total		100
Available spaces		
Living room	19	38
Bedroom	50	100
Kitchen	50	100
Toilet	50	100
Bedroom positioning		
Ground floor	42	84
Upper floor	08	16
Total	50	100
Toilet/Kitchen positioning		
Attached	16	32
Detached	34	68
Total	50	100
Years spent in apartment		
1-10	11	22
11-20	09	18
20-30	07	14
Above 30	23	46
Total	50	100

Variables	Frequency	percentage
Residence perception of their residence		
Stay	09	18
Relocate	14	28
Stuck	27	54
Total	50	100
Building status		
Structurally sound	10	20
Need minor maintenance	24	48
Need major maintenance	16	32
Dilapidated	0	0
Total	50	100
Level of repair		
Renovation	34	68
Rehabilitation	16	32
Demolition	0	0
Total	50	100

Source: Field survey, 2016

Assessment of the aged space preference and state of satisfaction

Table 3 and Table 4 revealed the respondents' preferences and level of satisfaction to the spaces they most identified with. These spaces are the living room, bedroom, kitchen and toilet spaces. The respondents referenced that most of their daily activities were done in those spaces. The findings in Table 1, as earlier mentioned, revealed that about 70% of the respondents aged above 65 years suffered visual impairment. Meanwhile, the design configuration of their buildings have rooms arranged in a row double banked lobby that could be as long as twelve metres (12m) depending on the number of rooms on each side.

The possible lighting to this lobby comes either from the entrance door from the porch or through the exit door towards the back of the house. Majority of the rooms are not cross ventilated, badly oriented, yet the community is also a victim of erratic electric power supply that engulfs Nigeria as a whole. That is why the respondents' assessment of indoor visual quality for the four spaces are not satisfactory as shown in Table 3. Consequently, the poor quality of lighting in the interior has made it difficult for those adults with poor vision to navigate their indoor environment to perform their daily activities. Therefore, they remain more dependent on their family and neighbours.

Table 3 revealed that all the respondents ranked the kitchen among the space of high importance to their daily needs. From table 2, it is observed that 68% of the houses studied have the kitchen and the toilet detached completely from the building (see also plates 4&5). Table 1 also revealed that only 30% of the respondents neither had bad sight nor suffer any disability. This shows that about 70% of the respondents having an impairment pass through the stress of navigating from their room to the detached kitchen and toilet daily.

This cannot have been stress-free without help from family or neighbours. Apart from the proximity issues, the respondents also express their dissatisfaction towards the numerous number of users of the spaces, the lifestyle of the different users, and level of privacy to their utensils. Although some of the older adult expressed their contentedness with the routine and the use of the space, majority, however, complained that their inability to walk properly poses major challenge. Therefore, having the kitchen and toilet spaces closer to their bedroom would have improved their level of independence and satisfaction.

Plate 4: Kitchen/toilet positioned beside a residence

Plate 5: Kitchen/Toilet positioned at the rear side of the building

The majority (70%) that either live in the family house or rented their apartment are the ones that express dissatisfaction with the bedroom size. They complained that their younger co-residents have many young children that often disturb them with their noise, thus depriving them of good rest required at their age. Close to three-fifth (58%) of the respondents were not satisfied with the size of their kitchen, while 54% found their toilet space only tolerable.

Although, these aged might wish to age in the house they have been conversant with for many years, the condition of the environment does not support ageing in place. Their inability to relocate or rehabilitate to suit their present need at old age due to their tenure status or income capacity make their continued stay in the neighbourhood a result of 'being stuck' in the place rather than ageing gracefully in the place.

Table 3: The Aged view of space importance

Variables	Important	Percentage %	Not important	Percentage %
Bedroom	50	100	--	--
Living room	50	100	--	--
Kitchen	50	100	0	--
Dining	8	16	42	84
Toilet/bath	50	100	--	--

Source: Fieldwork, 2016

Table 4: The Aged level of satisfaction of their interior spaces

	Variables	Satisfactory (%)	Tolerable (%)	Not satisfactory (%)
Bedroom	Space size	30 (60)	18 (36)	2 (04)
	Accessibility	24 (48)	03 (06)	3 (06)
	Functionality	16 (32)	07 (14)	27 (54)
	Visual	0 (0)	12 (24)	38 (76)
Living room	Space size	17 (34)	02 (04)	04 (08)
	Accessibility	19 (38)	0 (0)	0 (0)
	Functionality	0 (0)	08 (16)	11 (22)
	Visual	0 (0)	05 (10)	14 (28)
Kitchen	Space size	14 (28)	7 (14)	29 (58)
	Accessibility	5 (10)	7 (14)	38 (76)
	Functionality	14 (28)	0 (0)	36 (72)
	Visual	0 (0)	12 (24)	38 (76)
Toilet	Space size	14 (28)	27 (54)	9 (18)
	Accessibility	5 (10)	6 (12)	39 (78)
	Functionality	17 (34)	0 (0)	33 (66)
	Visual	0 (0)	12 (24)	38 (76)

Source: Fieldwork, 2016

SUMMARY OF FINDINGS

This study has helped to unfold the challenges of the old citizen in the resident they aged in. the challenges identified by this study cut across the aged themselves, the housing condition and the interior spaces used by them.

The study showed as regards the respondents that majority of them are well above 65 years of age with only 30% percent of them been without an impairment such as bad sight, morbidity or disability. Also, majority of them lack proper rest, privacy to mention a few due to the type of housing facility they occupy. The study revealed that they all reside in a tenement type of house design due to the inadequacy in their income capacity to get a better accommodation.

Regarding the condition of the house the aged occupy, the study revealed that majority of the houses lack basic infrastructures and requires renovation. The houses were built with low quality materials and construction technology with detached kitchen and toilet, which the majority is pit latrine. In summary, most of the houses are overcrowded, unhygienic, has structural defect and general not habitable.

The interior spaces are characterized by poor visual quality due to the house design type, poor ventilation and interior planning due to bad building orientation, bad proximity to toilet and kitchen facilities made worse by their health challenges and inadequate bedroom size due to space constrain. Most of the respondents were not satisfied with their kitchen and

toilet. Prominent among reasons given for their dissatisfaction were lack of privacy, poor state of maintenance and habitability of the spaces.

This suggests they would have preferred a kitchen that improves privacy and a toilet that is closer to their bedroom. However, some of the respondents were of the opinion that although the toilet should be attached to the main house, it should not be close to their bedroom. Most of the respondents in this category use their bedroom for all their activities: lounge, kitchenette and dining. They, therefore, found the idea of the toilet being moved closer to their rooms 'very repulsive'. However, it may be conclusively stated that the challenge of space constraint compelled their using their bedrooms for multiple uses.

It could, therefore, be conclusively stated that most of the old adults sampled in this study are stuck with the old model houses that will not easily accommodate the changes that accompanies getting older due to poor construction material used, homeownership status and prohibitive cost the modification could require among many other reasons.

CONCLUSION

The study revealed that most of the buildings in the study area are not designed to support the needs of people over age 65 years. The study has also revealed that the houses sampled need internal restructuring in form of incorporating decent kitchen, toilet and bath facilities within buildings for convenience of the senior citizens. It is also revealed that majority of the sampled residents were in the low-income category, hence, could not adequately provide the required financial resources to do required building amendments.

There is therefore the need to develop a framework for the incorporation of the aged community into urban development. This is proposed with the view of enhancing the older adults' independence and wellbeing by formulating a theoretical and operational framework which will make key decision-makers in the building industry to consider how well the aged can fit into the development of a community and also create the avenue for service delivery of plans designed to assist them.

Also, there is need to develop affordable low cost housing and payment schedule that the people with financial disability can benefit from so as to have a habitable housing to themselves. A regular performance evaluations on provided housing units is highly suggested at close intervals as this could serve as feedback on the extent at which the buildings meet the need of the people, particularly at old age.

Further research can be done on ageing in place limitation through the rigidity of design and its odds considering the material characteristic of the building. Also, this research can be furthered to investigate the extent of modification that can be done on existing structure and its implication on the structural stability of the building.

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SURVEYING & GEOIFORMATICS

A METHOD FOR ASSESSMENT OF OPTIMAL CHOICE OF PARAMETRIC MODEL IN LEAST SQUARES COLLOCATION.

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The process of choosing a suitable parametric model prior least squares collocation suffers from a high degree of arbitrariness. Although, the congruency test (wherein$\sigma^2{}_0 = \sigma^2$) gives an overall impression on the validity of the model, but further testing is always required, even when the congruency test points to the contrary, since it is possible that effects from different modeling errors cancel each other out, in the computation of $\widehat{\sigma^2}$. Besides, the procedure for estimating the variance components from the parametric model is computationally tasking. A semi automated assessment procedure is therefore herein presented by considering some rudimentary statistics of residuals followed by a student's t- test on the mean of residuals. The model is simpler as it eliminates the need for variance component estimation and faster to implement compared to when strict reliance is placed on the congruency test in parametric model selection.

Keywords: *Least squares collocation, parametric models, stochastic models, adjustment computation.*

INTRODUCTION

The least squares collocation (LSC) is a useful mathematical tool used in gravity prediction, filtering of anomalies and estimation of parameters that define the mathematical model (Ruffhead, 1987). In gravimetric network design, the LSC is a preferred mathematical tool for network adjustment. The process of LSC begins with the formation of observation equations that describe the physical behavior of the outcomes in relation to certain system parameters hence the need for formulation of suitable parametric equation that will accommodate all the essential parameters that affect the system. The process of choosing a suitable parametric model prior least squares collocation suffers from a high degree of arbitrariness. Earlier studies have shown that the parametric model used affects the estimated value of the variance component and consequently might lead to unreliable results since the variance component is often taken as a measure of accuracy (Nafisi, 2003).

A common method of determining suitable parametric models has been the use of the congruency test wherein $\sigma^2{}_0 = \sigma^2$ (Dermanis and Rossikopoulos, 1991) which requires that first a variance component estimate (VCE) be done after which an "f"-test is performed between the a-priori value and a-posteriori values of the variance of weighted observations. Unfortunately, VCE is a computationally tedious procedure and is itself dependent on an arbitrary choice of parametric model (Guo and xu, 2015). Besides, the variance component estimation procedure, pre-supposes that *no biases* or *systematic effects* are present in the data. Any unmodelled bias effect (which depends on the parametric equation) may propagate into the estimated variances and give unreliable results (Persson, 1981; Koch, 1999).

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The 3σ –rule is a simple and widely used heuristic for outlier detection especially in statistical based analysis (Lehmann, 2013). Although, the procedure is generally used for outlier detection and geodetic data filtering, it similarly gives an analyst an idea of the suitability of the underlying parametric model upon which the design matrix is built by taking advantage of the statistical properties of a least squares as a minimum variance estimate that is distribution-free.

In this work, a semi-automated assessment procedure is presented by considering some rudimentary statistics of residuals followed by a student's t- test on the mean of residuals to determine the most suitable among eight (8) tested parametric models using the south Western part gravity points of Nigeria as a case study.

Statistical checks for assessment of model fit.

Before performing a least squares estimate, certain statistical checks could be used to assess the fit of the parametric model. Assessing model fit is an essential task in a least squares estimation since the quality of the results obtained depends on the correctness or otherwise of imposed model. A good parametric model has the following assumptions (Vanicek et al, 2001):

1) The mathematical expectation of the resulting residuals has zero error i.e mean 0 error
2) Residuals have constant variance
3) The error is normally distributed
4) Observational errors are independent.

Considering the above stated assumptions, an analysis of the residuals obtained from a particular parametric model could be used as a precursory guide in determination of model suitability since the residuals of a least squares estimate are of great significance (Lehmann, 2012). Analysis of residuals involves certain statistics which include:

(i) **Normalized residuals**:
Given the Gauss Markov model, the residuals are given as (1)

$$V = A\widehat{\widehat{X^a}} - L^b \quad (1)$$

Where: A = design matrix and has a rank 3 if the equations are consistent

X^a = Vector of adjusted parameters

L^b = Vector of observations

V = Vector of residuals

Since the variance (σ^2) is given as (2)

$$\hat{\sigma}^2 = \frac{V^T PV}{n-m} \quad (2)$$

Where P = observational weight
n = number of equations
m = number of parameters

The normalized residuals in a least squares are then computed as given in (3):

$$V_{norm} = \sum \frac{V_i}{\hat{\sigma}\sqrt{q_{vv,ii}}} \quad (3)$$

Where

$q_{vv,ii}$ = corresponds to the ith diagonal of the cofactor matrix of residuals (Q_{vv})

$Q_{vv} = P^{-1} - A(A^T PA) - A^T$

P = Weight matrix

(ii) **Sum of squares of residuals** (SSR):

The sum of squares of residuals is given as (4)

$$\text{SSR} = \sum v^2 = \sum((A\widehat{\widehat{X^a}} - L^b)^2) \quad (4)$$

(iii) Standard error (SE):

$$SE = \frac{SSR}{df} \quad (5)$$

(iv) Error distribution

Although, the least squares method is a distribution fee method, computation of confidence intervals and hypothesis testing of the resulting data requires that the error are normally distributed i.e $v \sim N(0, \sigma^2 P^{-1})$ which is a pre-requisite for equation (6) to hold

$$v = -Q_{vv} P\, L^a \quad (6)$$

Where L^a = vector of adjusted observations.

Identifying the data distribution for non-repeated observations could be problematic. The standard geodetic approach is to assume a balance in the number of positive and negative values of residuals as a standard tool for determining the normality or otherwise of residual distribution.

If the sum of positive residuals balances with the sum of non-positive values, then the residuals are considered normally distributed and vice versa.

(v) 3σ-rule for outlier detection

As a general rule of thumb, observations larger than 3σ are often considered as outliers in data adjustment (Lehmann, 2012). However, it is logically reasonable to state that the better the model fit, the more points the model accommodates, hence the lower the number of outliers. The rule is mathematically described by (6)

$$\text{If } v_i \geq 3\sigma \quad (7)$$

Then i is an outlier observation.

(vi) The student-t test statistic

From the vector of residuals, the t-statistics is then used to further ascertain correctness of the model. Since the least squares estimate is aimed at minimizing the sum of squares of observations, then (8) holds as stated below:

$\sum v^2$ = minimum (8a)

$$v^T PV = minimum \quad (8b)$$

$$\therefore H_0: E\{v\} \leq 0 \quad (8c)$$

$$H_A: E\{v\} \geq 0 \quad (8d)$$

Taking equation 8c and d, the Null and alternative hypothesis respectively become:

H_0: The mean of residuals is less than or equal to zero therefore the model is optimal

H_A: The mean of residuals is greater than zero therefore the model is not optimal

To test the hypothesis, the one sample student t-statistic given by (9) is then used thereby statistically validating the correctness of the model.

$$t = \frac{\bar{x} - \mu}{SE} \quad (9)$$

Where:

μ = hypothesis mean

$\bar{x}$ = Sample mean

SE = standard error.

Parametric Model

Determining a suitable parametric model that could efficiently represent the gravity field of a study area is an essential step in LSC since the design matrix is dependent on it. Since the parametric model is expected to include all the known parameters that affect the system. In this work, eight (8) models were tested in order to determine the optimal amongst them using the statistical criteria earlier discussed. The tested models are given in equations 10 (a – h).

$$\Delta g = x_0 + x_1\varphi + x_2\lambda \quad (10a)$$

$$\Delta g = x_0 + x_1\gamma + x_2\gamma^2 \quad (10b)$$

$$\Delta g = x_0 + x_1 h + x_2 h^2 \quad (10c)$$

$$\Delta g = x_0 + x_1 h + x_2 \gamma + x_3 h\gamma \quad (10d)$$

$$\Delta g_{ij} = \delta\gamma_{ij} - \delta g_{ij} + \Delta g_i \quad (10e)$$

$$\Delta g = x_0 + x_1 \varphi + x_2 \lambda + x_3 h + x_4 \gamma \quad (10f)$$

$$\Delta g = x_0 + x_1 \varphi + x_2 \lambda + x_3 \varphi\lambda + x_4 h + x_5 \gamma + x_6 h\gamma \quad (10g)$$

$$\Delta g = x_0 + x_1 \varphi + x_2 \lambda + x_3 \varphi\lambda \quad (10h)$$

Where:

Δg = gravity anomaly

$x_0 \ldots x_n$ = parameter coefficients

φ, λ, h = 3D station geodetic coordinates in degrees, degrees and meters respectively.

γ = station normal gravity computed based on the WGS84 normal gravity formulae.

i and j = occupied station and control/reference station respectively.

Data used:

A total of 4511 gravity data points located across the entire country was collected from the BGI (Bureau Gravimetric International) database. The data were collected from various sources and archived by the BGI (see table 1 for various data sources). The data was then filtered for noise and non-homogeneity using the standard cross over adjustment technique (Odumosu et al, 2016) leaving 2634 nationally homogenous points. The Baarda's outlier detection technique and 3σ-rule was then used to remove outlier observations. A total of 1074 nationally consistent points were left after filtering of which the 193 points located within South Western part of Nigeria.

These 193 points were used in this study in an attempt to model the gravity field of the study area using the LSC.

Table 1: Gravity data from various sources (Collected from BGI)

S/N	Data Source	Number of points	Accuracy (mgals)	Date of Observation
1	IGSN-71	1	0.040	1-11-1961
2	Euro/African Secondary Calibration Line survey	4	0.032	1-11-1965
3	British Antarctic Survey	63	Not available	1-11-1975
4	Academy of Science, France	11	Not available	1-11-1938
5	Princeton University, USA	220	Not available	1-1-1969
6	University of Leeds	789	Not available	1-11-1984
7	Geological Survey of Nigeria	987	Not available	1-11-1961
8	Shell Exploration Company	69	Not available	1-1-1965
9	University of Ibadan	192	Not available	1-1-1978
10	Ahmadu Bello University, Zaria	151	Not available	1-1-1978
11	University of Ibadan	303	Not available	1-1-1978
12	University of Calabar and Leeds	1074	Not available	1-1-1984
13	Cratchley, C. R (1960)	460	Not available	1-1-1960
14	Anonymous observer	69	Not available	Unknown
15	Garcia, G	117	Not available	1-11-1967

METHODOLOGY:

Figure 1 pictorially describes the methodology herein presented for model optimality determination. The process starts by computing the OLS based on the selected parametric model and evaluating the residuals obtained. From the obtained residuals, the various test statistics as earlier discussed are carried out in sequence all to determine model optimality.

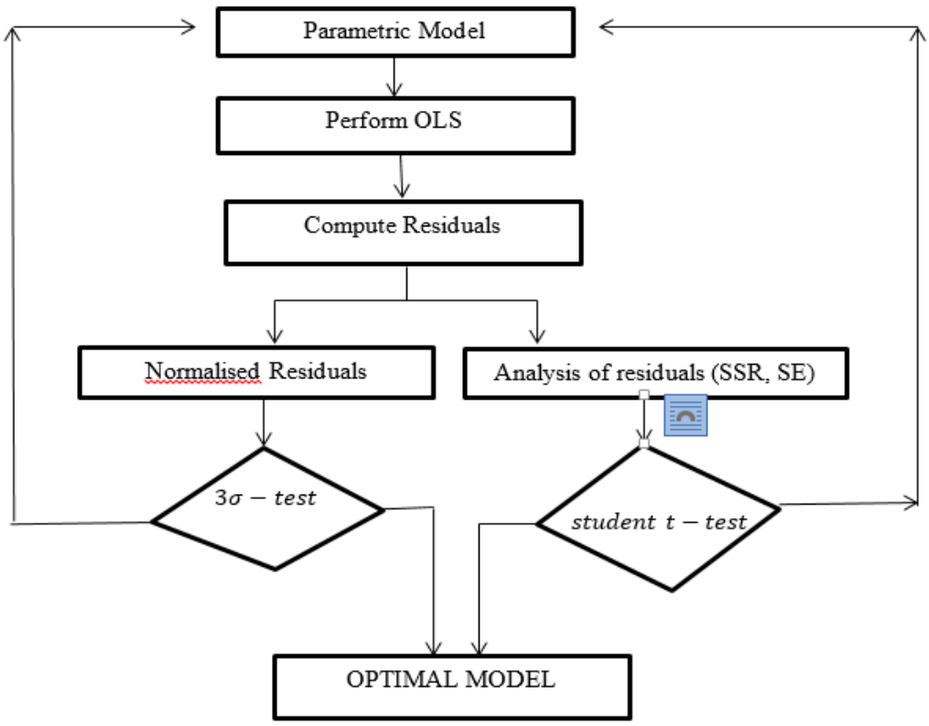

Figure 1: Flow chart of model execution methodology.

Models that indicate fewer outliers based on the 3σ-test are considered suitable since they have effectively fitted well into most of the data used. But the 3σ-test cannot be used as the only basis for suitability determination. Further tests are therefore before a decision can be taken. The further tests are done by analyzing the residuals using the sum of squares of residuals (SSR) and standard error (SE). Amongst the two analysis the sum of squares of residuals is more important since the principal objective of a least squares is to minimize the sum of squares of weighted residuals.

After the residuals have been analysed the student-t test is performed to test the hypothesis statistically. The *t* distribution provides a good way to perform one sample tests on the mean when the population variance is not known provided the population is normal or the sample is sufficiently large so that the Central Limit Theorem applies.

Therefore, if the P-value falls within the significance level (i.e $P \leq \alpha$ (0.05)) we do not reject the null hypothesis. Similarly, when the t critical value is greater than the t-observed i.e ($t_{crit} \geq t_{obs}$), the null hypothesis is sustained that the mean of residuals is less than zero therefore the chosen parametric model is optimal.

RESULTS AND DISCUSSION OF RESULTS

Presented in table 2 is a summary of results obtained from each model. The least squares adjustment was performed using both the weighted and unweighted models and the results are as presented in table 2.

Also results obtained from the t-test for each model is presented in table3. It is seen that although model 5 gave the least standard error and sum of squares of residuals which makes it appear to be the most suitable model, a look at the normality of the residuals indicate that the model residuals are not normally distributed but rather lump-sided. This non-normality is further seen in the hypothesis test of the model which rather than give the highest probability gave an average probability of 50% conformity of the data with the null hypothesis.

From table 2, we also observe that the more the number of outliers detected (based on the 3σ-test) in a model, the lesser the suitability of the chosen model because the outlier reduce the number of data points fitted into the model. However, this alone is not sufficient to take a decision about a model's suitability since model 5 though with most suitable SSR and minimal number of outliers the residual distribution and its percentage probability (as seen in table 3) suggest that it is not the most optimal model.

Table 2: Analysis of residuals

	Min Resi	Max Resi	Range_res	Distr	Norm_resi <= 3σ	Norm_resi > 3σ	Outliers	Std dev	Σv	Σv^2	Std Error	RMS
Model equation 1												
OLS	-37.25	29.05	66.30	Normal	191	0	0	12.54	2.80E-10	29562.92	12.54	12.44
Weighted LS	-40.48	29.21	69.69	Normal	117	74	74	0.94	-100.90	31089.94	12.86	12.76
Model equation 2												
OLS	-42.54	26.24	68.78	Normal	191	0	0	13.09	-1.68	32047.49	13.06	12.95
Weighted LS	-50.77	23.77	74.54	Normal	131	60	60	1.02	-571.66	36141.74	13.87	13.76
Model equation 3												
OLS	-46.72	25.02	71.74	Normal	191	0	0	12.42	0.00	28982.49	12.42	12.32
Weighted LS	-53.43	21.32	74.75	Normal	131	60	60	0.99	-653.99	32729.05	13.19	13.09
Model equation 4												
OLS	-35.76	6.40	42.16	Normal	191	0	0	12.41	-0.0076	28811.5576	12.41	12.28
Weighted LS	-53.30	19.61	72.91	Normal	130	61	61	1.01	-694.68	34924.6365	13.67	13.52
Model equation 5												
OLS	8.88 E -15	4.26 E-14	3.11E-14	Lump sided	191	0	0	2.89 E -14	0.00	0.00	0.00	0.00
Weighted LS	-1.95 E-14	3.55 E-15	2.31E-14	Lump sided	190	1	1	7.03 E -16	0.00	0.00	0.00	0.00
Model equation 6 (5 parameters)												
OLS	-18.13	32.97	51.10	Normal	190	1	1	8.33	2.600	12584.372	8.23	8.12
Weighted LS	-27.69	38.73	66.42	Normal	123	68	68	0.70	-64.650	14657.986	8.88	8.76
Model equation 7 (7 parameters model)												
OLS	-16.85	22.41	39.26	Normal	190	1	1	6.25	-52.58	7181.48	6.25	6.13
Weighted LS	-16.42	21.65	38.07	Normal	122	69	69	0.56	-55.24	7235.25	6.27	6.15
Model equation 8												
OLS	-22.37	27.63	50.00	Normal	191	0	0	9.33	0.00	16267.81	9.33	9.23
Weighted LS	-24.18	27.56	51.74	Normal	118	73	73	0.73	-31.91	16425.19	9.37	9.27

Table 3: Result of hypothesis test

Model No	8	7	6	5	4	3	2	1
Count	193	193	193	193	193	193	193	193
Mean	-0.61	-0.15	0.34	0.01	0.39	0.07	0.51	0.73
Std dev	12.70	12.41	12.94	12.82	12.40	12.52	12.53	12.52
Std error	0.91	0.89	0.93	0.92	0.89	0.90	0.90	0.90
Hypothesis mean	0	0	0	0	0	0	0	0
alpha	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05
tails	1	1	1	1	1	1	1	1
df	192	192	192	192	192	192	192	192
t-stat	-0.67	-0.17	0.37	0.01	0.43	0.07	0.57	0.81
p value	0.75	0.57	0.36	0.50	0.33	0.47	0.29	0.21
t-critical	1.65	1.65	1.65	1.65	1.65	1.65	1.65	1.65
Significance	ACCEPT	ACCEPT	ACCEPT	ACCEPT	ACCEPT	ACCEPT	ACCEPT	ACCEPT

A glance at table 3 suggests that the model 7 despite the significant number of outliers it identifies. Comparing the results of model 3 on both tables, we see that the SSR of the model is the next most suitable after model 5 (which is the principal objective function of a least squares). Furthermore, it shows a 50% probability of statistical suitability which is next to the highest P value of 75%. Model 8 is seen to show the statistically most significant result but from previous analysis does not seem to conform to the factors that make for model suitability. We therefore can see that the statistical significance test alone does not suffice to determine model suitability hence stressing the importance of further testing.Model 7 which though rank second best fit in terms of analysis of residuals and also statistical test is considered most suitable. This is because the model maintains consistently suitable results for both the analysis of residuals and the test statistics. It is therefore chosen as the most suitable model describing the gravity data distribution across the study area and thus adopted as the chosen parametric model for the least squares collocation (LSC).

CONCLUSION AND RECOMMENDATION

This work presents a simple and easily implementable method for confirming model suitability to be used in LSC. The method incorporates the use of analysis of model residuals with statistical t-tests in checking mathematical models. It is concluded that integration of the residual analysis with the statistical test provides model users a more scientific and rationale means of judging model suitability than mere dependence on only the statistical test.

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INVESTIGATION OF THE ROBUSTNESS OF DIFFERENT CONTOUR INTERPOLATION MODELS FOR THE GENERATION OF CONTOUR MAP AND DIGITAL EVELATION MODELS

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This research seeks to investigate the robustness of ten different methods for contour interpolation in Surfer10.0 software namely: Inverse distance to weighting power (IDP), Kriging (KRG), Minimum Curvature (MC), Nearest Neighbor (NENE), Polynomial Regression (PR), Radial Basis Function (RF), Modified Shepard's Methods (MSM), Natural Neighbor (NANE), Triangulation with Linear Interpolation (TWLI) and Local Polynomial (LP). Hi Target Differential Global Positioning System (GPS) receiver was used for the spatial data (x, y, z) acquisition within the study area which was used for gridding and generation of contour maps and DEMs using each of the investigated interpolation method. From the surface models generated, twenty sample points were selected and their heights verified on the ground using a DGPS receiver. Comparative evaluation reveals that minimum curvature (236.4269m) and kriging (236.4674m) had the closest value to the observed value while MSM gave a value that is far higher than the observed height (236.8585m). Statistical investigations were carried out and the results also revealed that minimum curvature and kriging do have the best topographic representation of the study area, which is also supported by the low values of their RMSE of 0.2806 and 0.3109 respectively, while the modified shepard's method produced the highest RMSE value of 0.9100.

Keywords: contour interpolation, contour maps, digital elevation models, topographic representation.

INTRODUCTION

Interpolation is a method or mathematical function that estimates the value at locations where no measured values are available (Azpurua and Ramos, 2010) using nearby known data point (Vohat et al., 2013). Contour is the most commonly used method for relief mapping (Hiremath and Kodge, 2010), it is an imaginary line drawn on the map by joining points of equal elevation which are generated through contour interpolation. The method for converting discrete points collected into a continuous surface is called interpolation. Contour interpolation is a ubiquitous phenomenon (Guttman and Kellman, 2004), used to calculate unknown height of points by referring to the elevation information of neighboring point (Yang et al., 2006). Contours are of great importance in many fields or disciplines such as engineering works where they play vital roles in site location, cut and fill formation level of road or railways, location of catchment areas, dams, reservoirs, etc. Many other professionals such as Geologists, Agricultural scientists, Geographers, Archaeologists, Town planners, Architects, among others also find contour very useful in their various fields. Contour maps are also used in environmental statistics and applied spatial statistics to display estimates of continuous surface (Bolin and Lindgren, 2017), as source of data for the production of digital surface model such as digital elevation model (DEM) (Sharma et al., 2009), Digital terrain model (DTM) and Triangular irregular network (TIN) which are used in representing the earth's surface in 3 Dimensions, as well as in the rectification of aerial photographs or satellite imaginary, creation of relief maps, terrain analysis, precision farming, among others.

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Data used for contouring can be sourced directly from the field using ground survey, photogrammetry (Ali, 2004), satellite imageries (Ozah and Kufoniyi, 2006) or from existing topographic maps which could be in the form of point data or image. The direct ground surveying method is usually used for relative small size area which involves measurement carried out on the ground using surveying equipment to acquire point data in XYZ. Some of such equipment used includes theodolite, tacheometer, total station, level instrument and differential global positioning system (DGPS) receivers. Among all these ground survey equipment, DGPS receivers are highly sophisticated instruments, which provides a means for acquiring accurate and reliable data over a relatively open area in a short time, with significant accuracy.

The capability to easily create digital contours using commercial software has existed for decades (Tyler and Greenlee, 2012). The contour interpolation methods have significant impacts on the accuracy of the map (Shen et al., 2017) especially for a small area of land which are usually required for engineering works. There are various methods used for contour interpolation using different software packages. Some software for contour interpolation includes ArcGIS, Map source, AUTOCAD, ArcGrid, Surfer etc. Among the various contour interpolating software is SURFER. Surfer software is developed by US Golden Company and it is a grid based contour interpolation software used for 3D representation and visualization of the earth's surface. It provides various methods for contour interpolation. For this paper, Surfer 10.0 version is used and the methods explored includes, Inverse distance to power (IDP), Kriging (KRG) Local Polynomial (LP) Minimum Curvature (MC), Modified Shepard's Methods (MSM), Natural Neighbor (NAN), Nearest Neighbor (NN), Polynomial Regression (PR), Radial Basis Function(RBF) and Triangulation with Linear Interpolation (TWLI). The choice was random and also based on the most popular interpolation method used by land surveyors and other geospatial scientists.

The main aim of this paper is to investigate the robustness of these contour interpolation models which are all available in Surfer 10.0 software, for the accurate generation of contour maps and digital elevation models which will be a guide to the professionals who uses contour interpolation in choosing the right and most appropriate method.

Some Methods of Contour Interpolation In Surfer 10.0

Surfer is a grid based contour software which uses observed data from the field which are in the form of XYZ data file to create and calculate data points on a regularly spaced grid (a Grid [GRD] file). At points where no original data exists in respect to the observed data, interpolation schemes estimates the value of such points and then produces contour maps from the grid. The gridding method in Surfer 10 can be divided into 2 categories; exact and smoothing interpolators.

Exact interpolators honor exactly the data point on the condition that the data point falls completely on a grid. In other to reduce the possibility of not honoring original data points, there is a need to increase the number of grid lines in the X and Y direction which increases the chance of the data point to coincide with the grid nodes. For a weight average interpolator, this simply means that the data that coincides with the grid node has weight of 1.0 while every other data has a weight of 0.0. When the data measured cannot be trusted, the smoothing interpolator is employed. The smoothing interpolators makes little changes to the weighing factor in such a way that a smoother surface will be generated such that even when data points are exactly coincident with the grid node, smoothing interpolators do not assign weight of 1.0 to any data point. This however doesn't mean that the surface generated is not an accurate representation of the data (Http://crack.seismo.unr.edu/ftp/pub/louie/class/333/contour/surfer.pdf, n.d.).

Inverse Distant to Power (IDP)

This is a weighted average interpolator and can either be an exact or a smoothing interpolator. Inverse distance weighting models use the notion that observations further away should have a lower contribution than those which are near the point of interest (Griffiths, 2010). In this method, during interpolation, data is weighted such that point with greater distance from the grid node has lesser influence than those closer to the grid node. The power parameter controls how the weighting factor drops off as distance from a grid node increases. Closer points are assigned higher fraction of overall weight while other points are assigned lower weight fraction. Therefore, points closer to the unknown points are used to interpolate

the value for that point. It is a very fast method for interpolation however, it has the tendency of generating the "bull eye" effect

Kriging (KRG)

The Kriging interpolation method also known as space autoco-variance best interpolation method was proposed by a South African geological engineer D. G. Krige and improved by French mathematician G. Matheron (Chen et al., 2014). The method is known to produce visually pleasing contour from irregularly spaced data. Kriging is a stochastic method that estimates the value of a natural phenomenon in unmeasured sites using an unbiased linear combination of neighboring measures of the phenomenon with a minimum variance (Le Conte, 2006). Kriging can be an exact interpolator or a smoothing interpolator (Vohat et al., 2013) depending on the user's specified parameters. The core idea behind Kriging is that different sample points are weighted in their importance on the basis of their spatial location as well as their degree of correlation such that the estimation error is minimized. This method is widely used in calculation of mineral reserves, remote sensing data processing, geology, hydrology, environmental science, agriculture, and forestry science (Chen et al., 2014).

Local Polynomial (LP)

The Local Polynomial method assigns values to grid nodes by using a weighted least squares fit, with data within the grid node's search ellipse and works best with data sets that are relatively smooth within search neighborhoods (support.goldensoftware.com).

Minimum Curvature (MC)

This was developed by W.H.F. Smith and P. Wessel in 1990, It is not an exact interpolator, however while attempting to honor original data, minimum curvature generates the smoothest possible surface. The speed of computation is high, hence a suitable method for a large number of points *XYZ*. The disadvantage of this method is that, it has a complicated algorithm and cannot conserve extrapolation trends (Dressler, 2009).

Modified Shepard's Method (MSM)

This method uses an inverse distance weighted least square method. Therefore, it is similar to the inverse distance to power interpolator. But the bull's eye effect present in the inverse distance to power method is reduced in this method by the use of least squares. Shepard's method can either be an exact or smoothing interpolator.

Natural Neighbor (NAN)

The Natural neighbor works based on Voronoi tessellation which can be defined as "the partitioning of a plane with *n* points into *n* convex polygons such that each polygon contains exactly one point and every point in a given polygon is closer to its central point than to any other" (Dressler, 2009). This simply means that the natural neighbor uses a weighted average of the neighboring observations to interpolate an unknown value and thus generates contour lines. The Natural Neighbor method does not extrapolate the Z grid values outside the range of data and it does not generate nodes in areas without data.

Nearest Neighbor (NN)

In this method, the value of the nearest datum point is assigned to each grid node. This method comes in handy when the data is already in grid but however, needs to be converted to surfer grid file, or in a case where the data are nearly on grid with few missing values, this method helps in filling in the missing values.

Polynomial Regression (PR)

Polynomial regression does not predict unknown elevation values. It is not really an interpolator. It is used to define large scale trends and pattern in the data.

Radial Basis Function (RF)

Radial Basis Function interpolation is a diverse group of data interpolation method considered by many to be the best due to its ability to fit source data and to produce a smooth surface (Vohat et al., 2013; Yang et al., 2004). All of the Radial Basis Function are Multiquadric method and exact interpolators which attempt to honor every available data (Yang et al., 2004), and it is similar to Kriging due to it is flexible and ability to generate an

exact interpretation of most data sets. It can also produce a smooth surface as well as handle large data sets (support.goldensoftware.com).

Triangulation with Linear Interpolation(TWLI)

This method is historically one of the first methods used before the intensive development of computers (Dressler, 2009). This is an exact interpolator. This method works by drawing lines between data points to create triangles. The observed data points are connected such that no triangle edge is intersected by other triangles. This method is most effective when the observed data is evenly distributed over the grid area. It is a very fast algorithm but its limitations includes the fact that, the domain of the function is limited to the convex envelope of the points *XYZ*, the resulting surface is not smooth and isolines consists of line segments.

RESEARCH METHOD

Study Area

Minna is the capital city of Niger State, which is located at the North central region of Nigeria. The study area for this research is situated in the Federal University of Technology, permanent site, Gidan –Kwano, Minna, Niger State. The Institution is located along the Minna-Katerigi-Bida road which is about 12 km from Minna township. The study area (Figure 1) covers an approximate area of Eleven (11) hectares and it is located at the western part of the campus.

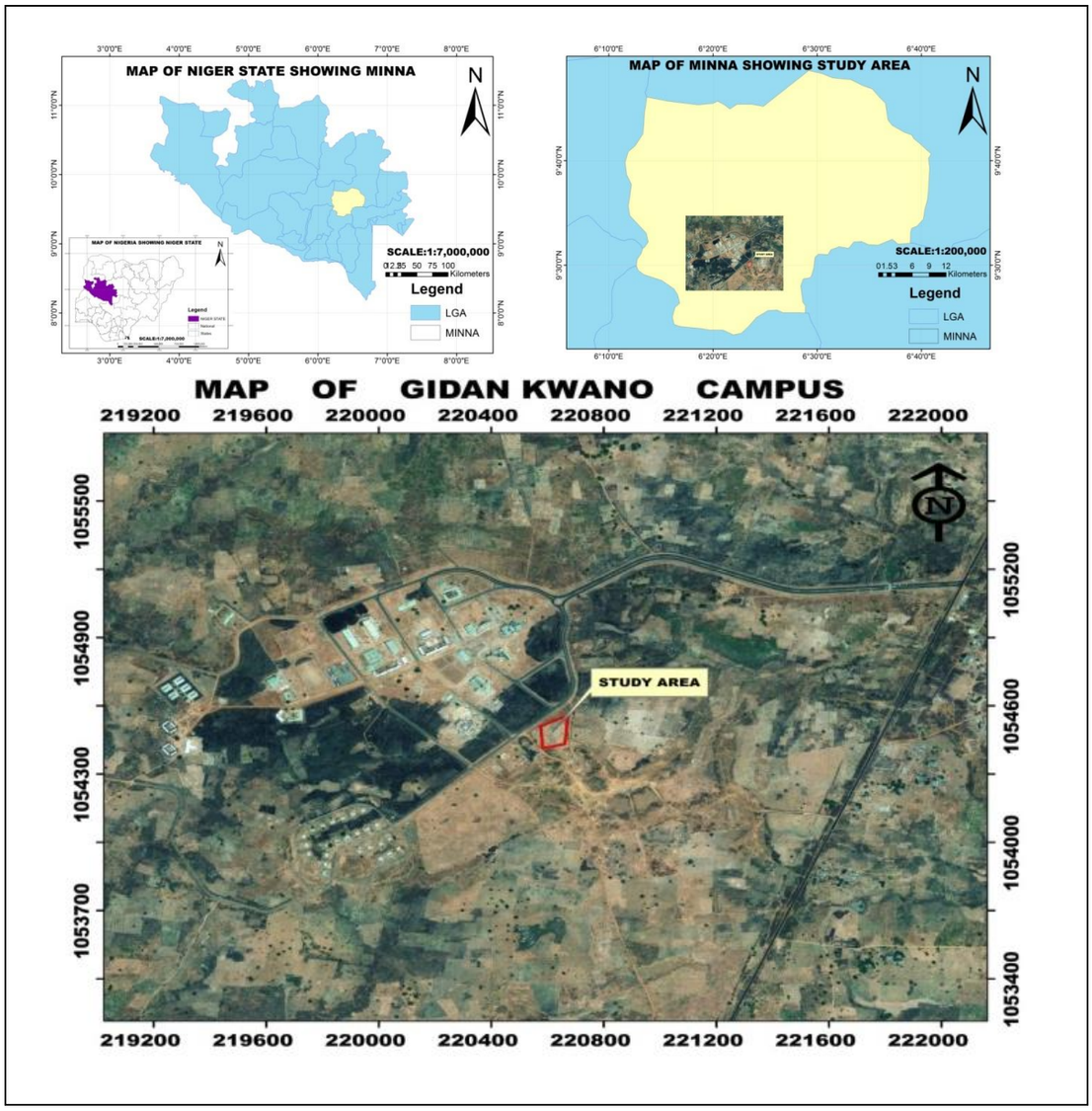


Figure 1: Study area

Data acquisition and pre-processing

The boundary of the study area was carved out and demarcated using iron pegs and perimeter survey was carried out using High-target V30 DGPS receiver to coordinate the pegged points defining the boundary, acquiring their Northing, Easting and height coordinate data. The spot heights of various points were randomly picked across the study area using the same DGPS receiver and the measured data was saved on the instrument's data logger. Approximately 560 sample points covering the total area of about 11 hectares were observed. The saved data was later converted to excel format (xlsx) before importing same into Surfer 10.0 software environment, in preparation for contour interpolation and generation of contour maps and DEMs.

Contour Interpolation and generation of DEMs

Since the data were not captured in gridded format (at a regular interval), The randomly selected ten (10) interpolation methods were used to grid the data into regular intervals. These methods are: Inverse Distance to Weighting Power (IDP), Kriging (KRG), Minimum Curvature (MC), Nearest Neighbor (NENE), Polynomial Regression (PR), Radial Basis Function (RF), Modified Shepard's Methods (MSM), Natural Neighbor (NANE), Triangulation with Linear Interpolation (TWLI) and Local Polynomial (LP). From the gridded data, contour surfaces were generated, depicting the topography of the study area. Since ten (10) different methods for interpolation were investigated for this research, ten (10) different contour maps were generated. Figures 2, 3, and 4 are the contour maps generated for each interpolation method used. The gridded data from each of the interpolation method was also used for the generation of DEM which is a 3-dimensional representation of the study area. Figures 5, 6, and 7 are the DEMs generated from the different interpolation method.

Accuracy assessment

Determination of the accuracy of interpolation methods is necessary in geosciences due to the developments in computer science and technology, and many different spatial interpolation algorithms which have been adopted in the software for surface modeling and GIS (Gogovi et al., 2014). In order to assess the accuracy of each of the contour interpolation methods, 20 sample points were selected on the same roll and column for the 10 different interpolation methods from the grid node editor in the Surfer 10.0 software environment. The Northing and Easting coordinates and the spot heights of the 20 sample points were extracted and recorded. The 20 sample points were also tracked on the ground by inputting their coordinates (Northing and Easting) into the data logger and using the DGPS rover to stake out the points on the ground. The spot heights of the staked-out points were then measured directly using the DGPS receiver. The sampled spot heights extracted from the ten interpolation methods were later compared with the spot heights of the same sample points measured directly by the DGPS receiver. Table 1 shows the interpolated sample spot heights and the spot heights measured directly by the DGPS receiver. The accuracies of the surfaces generated were evaluated using visual and statistical analysis. Using visual analysis, the spot height of each of the 20 sample points extracted from the ten-interpolation method was compared with the height measured directly to see which interpolation method gives a closer value to the measured spot height. The computed misclosures are shown Table 2. For adequate statistical analysis, the root mean square error (RMSE), Standard error, Scatter graph and correlation coefficient were examined to calculate the error for interpolated height values and to show the relationship that exists between interpolated and observed values.

Root Mean Square Error (RMSE)

From the computed misclosure, Root Mean Square Error (RMSE) was computed for each method using the formula given in equation 1. The computed RMSE for each of the methods investigated are shown in Table 3.

$$RMSE=\sqrt{\frac{1}{N}\sum_{i=0}^{n}(X_I-\chi_I)^2} \quad (1)$$

For every interpolation method used, there is a grid report automatically computed by the system software stating information such as, time taken for a method to grid the data, the standard deviation and standard error, Table 4 shows the information for each method.

Correlation

The correlation coefficient is a number between -1 and +1 which shows the strength of the linear relationship that exists between two variables. +1 shows a very strong positive linear relationship between the variables, 0 shows no relationship exists and -1 shows a very strong negative relationship between the variables. Table 5 and 6 respectively shows correlation coefficient between the interpolated height with observed height values and correlation coefficient of all the methods.

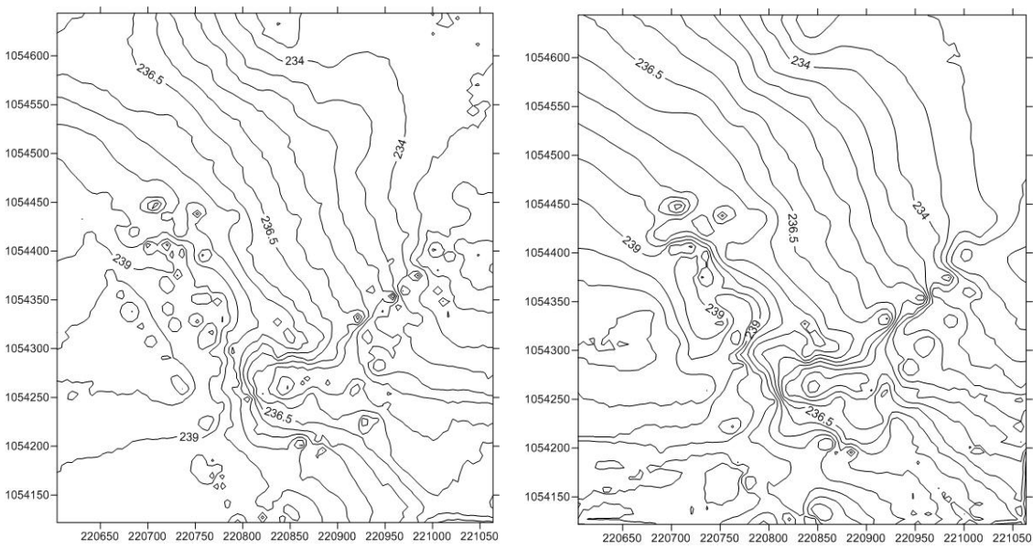
Scatter Point Graph

Scatter point graphs were also used to indicate the direction of the relationship for the heights interpolated for each method on the X axis against the observed method on the Y axis. Figures 8, 9, and 10 are the scatter point graphs for each method plotted against the observed data.

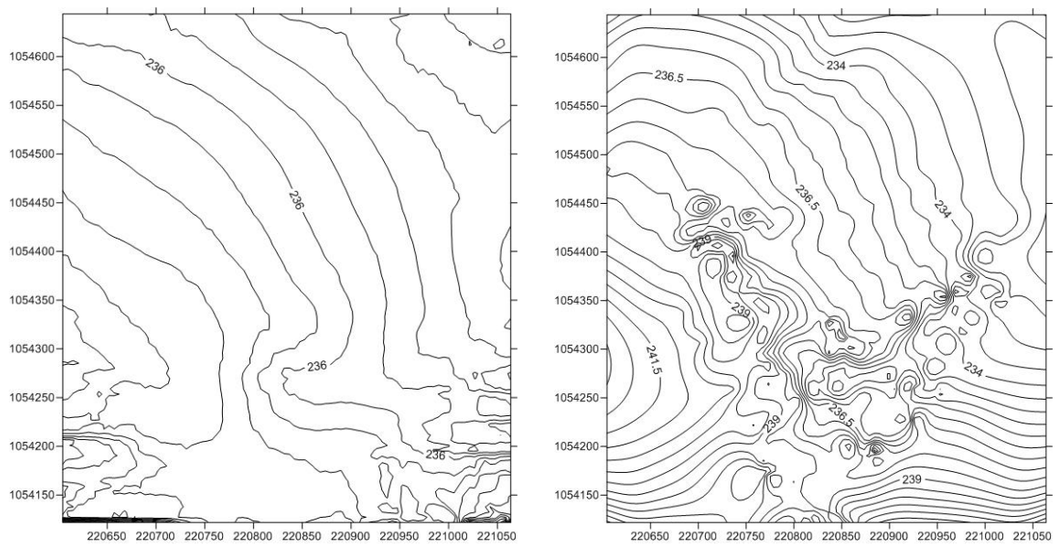
FINDINGS AND DISCUSSION OF RESULTS

Generated Contour Maps

Figures 2 A -D shows contour maps generated by Inverse distance to power (IDP), Kriging (KRG, Local Polynomial (LP) and Minimum Curvature (MC) methods respectively. The maps generated by IDP, Kriging and MC are more similar, and they gave a closer representation of the study area compared to LP although, Kriging and MC are more visually similar. Kriging is known to produce visually pleasing contours from irregularly spaced data using an unbiased linear combination of neighboring measures of the phenomenon with a minimum variance (Le Conte, 2006), and can be an exact interpolator or a smoothing interpolator in SUFER depending on the user's specified parameters. Also, the Minimum Curvature attempt to honor original data, and as such, generates the smoothest possible surface that exactly fit the dataset which makes it have a more similar visualization with kriging. The IDP contour lines are sparse and even sparser in Local polynomial generated contour map. This is due to the fact that IDP tends to generate bull's eye patterns which can be reduced by smoothing the interpolated grid. The LP has smooth curve and less dense contour lines. This is because LP fits the specified order (zero, first, second, third, and so on) polynomial using points only within the defined neighborhood. The LP also assumes that; the samples were taken on a grid (that is, the samples are equally spaced), and the data values within the searching neighbourhood are normally distributed.



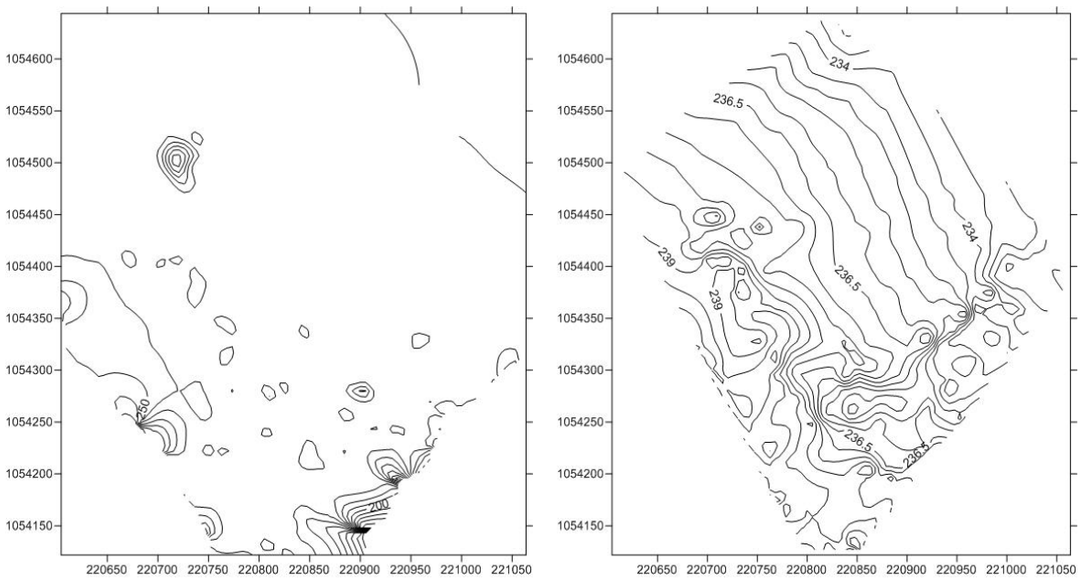
A = IDP B = kriging



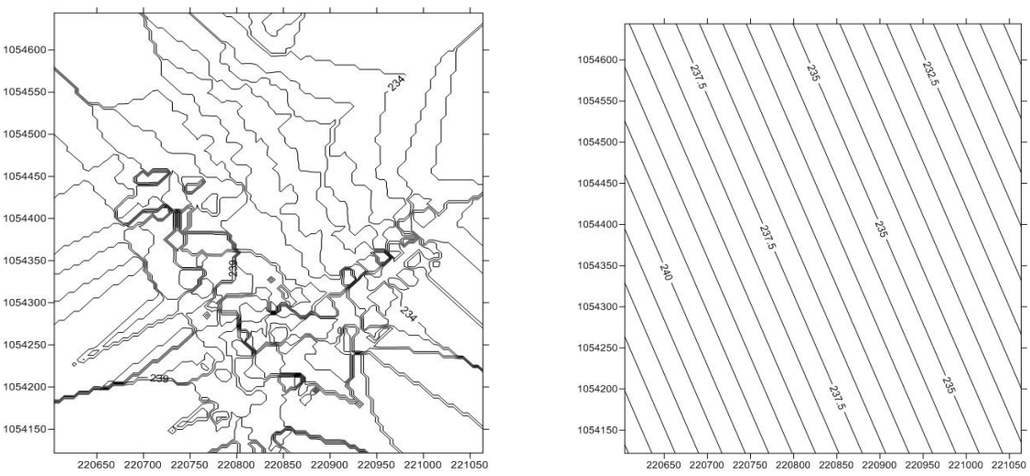
C = LP D = MC

Figure 2: Contour maps generated by Inverse distance to power A), Kriging B), Local polynomial C), and Minimum Curvature D) methods.

Figures 3 A-D are contour maps from Modified Shepard, Natural neighbor, Nearest Neighbour and Polynomial regression methods respectively. MSM and NAN shows contour covering only the boundary of the study area because both methods are exact although smoothing could be specified for MSM. Also, the Natural Neighbor method does not extrapolate contours beyond the convex hull of the data locations (Yang et al., 2004) while MSM gives a poor visualization of the study area using local least squares estimation. It generates fewer artifacts and can provide extrapolation. On the other hand, NN generated bulky contours with sharp edges because it is most useful for almost complete datasets (e.g. grids with missing values) and does not provide extrapolation. PR represents the area as a very flat terrain which is false as the study area is fairly rugged. The poor result obtained from PR is because it is not really an interpolator and it does not attempt to predict the value of elevation but rather, it defines large scale trends and pattern in the data.



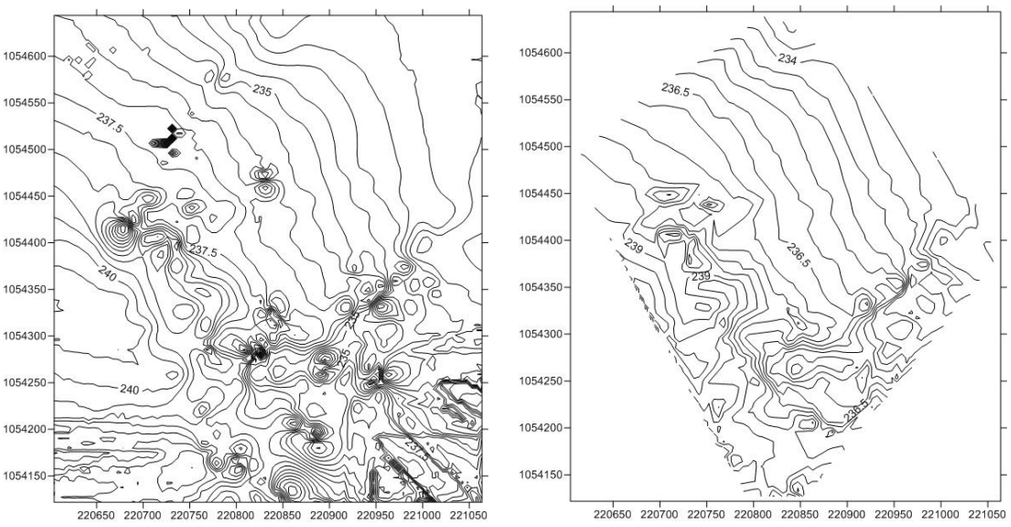
A= MSM **B= NAN**



C= NN **D= PR**

Figure 3: Contour maps generated by Modified Shepard Method A), Natural neighbor B), Nearest neighbor C), Polynomial regression D) methods.

Figures 4A and B shows contour maps generated from Radial Basis Function and Triangulation with Linear Interpolation methods respectively. RBF generated contours are closely packed, though they cover the entire region while TWLI contours covers only the boundary of the study area just like MSN and NAN. Both the RBF and TWLI are exact interpolators, and they honor the provided data as seen from the result in Figure 4 A and B, the representation of the topography are similar. The major difference is that the BWLI uses the original data to define the triangles. The data are honored very closely with the tilt and elevation of the triangle determined by the three original data points, defining the triangle hence, it fit into the boundary of the study area.



A= RBF **B=TWLI**

Figure 4: Contour maps generated by Radial Basis Function A), Triangulation with Linear Interpolation B) methods.

Derived Digital Elevation Models (DEM)

Figures 5 A-D presents the digital elevation model from triangulation with linear interpolation, Inverse Distance to Power, kriging and Local Polynomial methods respectively. Kriging and IDP DEMs are similar in their terrain depiction of the study area. Just like the contour it generated, the TWLI DEM only covers the boundary of the area while LP generated a DEM that represents the study area as a gentle slope terrain.

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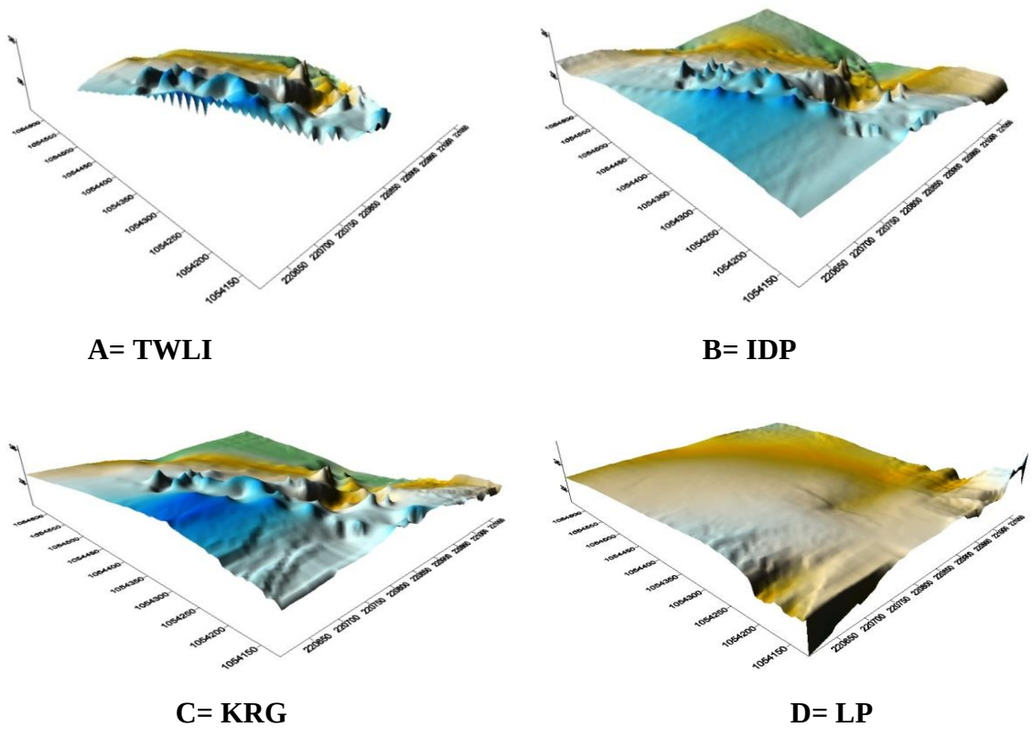


Figure 5: Digital elevation model from triangulation with linear interpolation A), Inverse Distance to Power B), kriging C), and Local Polynomial D) methods.

Figures 6 A-D is the digital elevation model from Minimum curvature, Modified Shepard, Natural Neighbor and Nearest Neighbor methods respectively. The worst of the DEMs generated is observed in the Modified Shepard method which generated a DEM that completely shows the opppsite of how the terrain configuration is, showing depression instead of elevation. NN DEMs had bulky edeges just as its generated contour map.

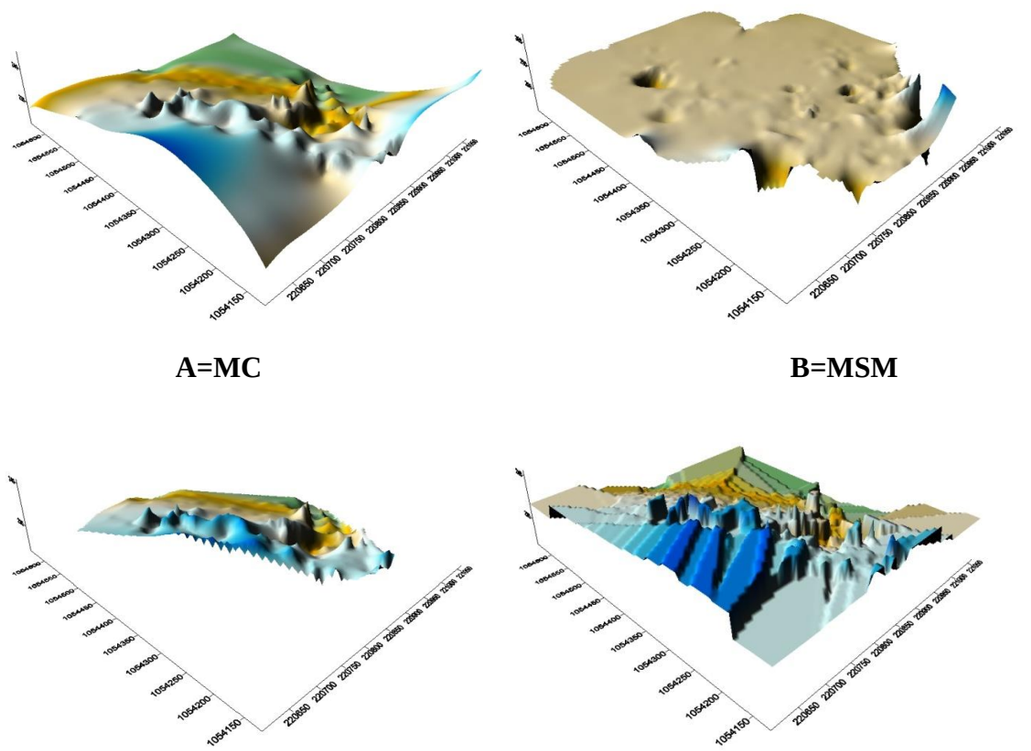
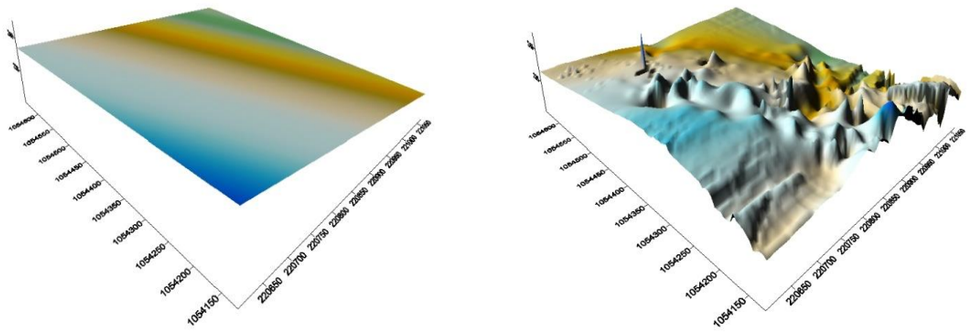


Figure 6: Digital elevation model for Minimum Curvature A), Modified Shepard B), Natural Neighbor C) and Nearest Neighbor D) methods.

Figure 7A-B shows the digital elevation model for Polynomial Regression and Radial Basis Function respectively. Polynomial regression generated DEMs shows the study area as a smooth flat terrain with no variation in height because the model is not really an intepolator.



A=PR **B= RBF**

Figure 7: Digital elevation model for Polynomial Regression A), Radial Basis Function B)

Interpolated sampled heights and Misclosures between interpolated heights and observed heights

Table 1 shows the spot heights of the 20 sampled points extracted from each of the ten interpolation methods and the spot heights of the same 20 sampled points measured directly on the ground using the DGPS receiver (shown in red). The interpolated heights were subtracted from the observed height to derive their misclosures which is shown in Table 2. High level of discrepancies can be observed in spot heights extracted from MSM, PR, RBF, TWLI and LP in comparison with the measured heights. Table 1: Interpolated sampled heights from different methods of contour interpolation in Suffer 10 and observed height from DGPS receiver

IDP	KRIGING	MC	MSM	NANE	NENE	PR	RBF	TWLI	LP	OBSERVED HEIGHT
236.4389	236.4674	236.4269	236.8585	236.4584	236.4964	236.1231	236.7159	236.4463	236.4722	236.4024
239.4287	239.7456	239.8900	239.5734	239.5405	240.1317	237.9893	239.6970	239.2892	238.8993	240.4663
234.7186	234.5543	234.5395	234.5756	234.5641	234.7760	234.2390	234.5391	234.5320	234.6282	234.5388
234.9440	234.8880	234.8918	234.9264	234.8796	234.9560	234.9130	234.9103	234.8826	234.6752	234.8183
234.6788	234.1609	234.1220	233.0443	234.0377	234.4565	233.7564	234.1427	234.0112	234.0270	234.0536
235.8095	235.8303	235.8001	235.8136	235.8183	236.0465	235.7388	235.8009	235.8062	235.7621	235.8420
235.0581	234.9726	234.9853	235.6167	234.9531	235.0096	234.5018	234.9900	234.9674	234.8499	234.8822
235.5124	235.5442	235.5313	235.5702	235.5461	235.5512	235.0184	235.5669	235.5469	235.3953	235.4673
236.8298	236.8613	236.8452	236.8757	236.9065	236.7395	236.6701	236.8387	236.9194	237.3381	236.7737
236.6134	237.3875	237.2829	237.3200	237.4020	236.7580	236.8309	237.2814	237.3972	237.6294	236.8173
236.4140	236.6556	236.4003	236.3022	236.9515	235.5697	237.7157	236.5252	237.1880	237.1242	236.4002
236.3545	236.7094	236.7433	236.4731	236.8091	236.8242	237.6013	236.6472	236.6157	236.7032	237.2284
236.4341	236.6083	236.5522	238.7436	236.5352	236.4543	237.0972	237.0738	236.4976	236.6400	236.2808
235.2590	234.7960	234.8904	234.2234	234.8947	234.9211	236.3858	234.4458	234.7671	235.5460	234.6149
236.4126	236.7555	236.8026	236.8259	236.7175	236.4563	235.9496	237.1409	236.7449	236.0814	236.8299
237.2381	236.9627	236.8745	236.6226	237.0054	236.6911	236.1785	237.1658	237.0383	236.9316	236.7476
238.4585	237.7424	237.8058	235.5386	237.8620	236.9709	237.9785	236.9083	237.8818	238.5179	237.1216
239.3147	239.7135	239.4814	237.3590	239.7220	240.5351	238.7239	238.9598	239.9940	239.4455	239.4413
235.8248	235.7038	235.6269	236.0027	235.7329	235.7809	236.2374	235.6321	235.8127	236.2800	235.8173
234.5545	234.3469	234.4236	234.2708	234.3408	234.4143	235.0094	234.2035	234.3390	235.0738	234.1314

Table 2: Misclosures between interpolated heights and observed heights

IDP DIFF	KRIGING DIFF	MC DIFF	MSM DIFF	NANE DIFF	NENE DIFF	PR DIFF	RBF DIFF	TWLI DIFF	LP DIFF
-0.0365	-0.0650	-0.0245	-0.4561	-0.0560	-0.0940	0.2793	-0.3135	-0.0439	-0.0698
1.0376	0.7207	0.5763	0.8929	0.9258	0.3346	2.4770	0.7693	1.1771	1.5670
-0.1798	-0.0155	-0.0007	-0.0368	-0.0253	-0.2372	0.2998	-0.0003	0.0068	-0.0894
-0.1257	-0.0697	-0.0735	-0.1081	-0.0613	-0.1377	-0.0947	-0.0920	-0.0643	0.1431
-0.6252	-0.1073	-0.0684	1.0093	0.0159	-0.4029	0.2972	-0.0891	0.0424	0.0266
0.0325	0.0117	0.0419	0.0284	0.0237	-0.2045	0.1032	0.0411	0.0358	0.0799
-0.1759	-0.0904	-0.1031	-0.7345	-0.0709	-0.1274	0.3804	-0.1078	-0.0852	0.0323
-0.0451	-0.0769	-0.0640	-0.1029	-0.0788	-0.0839	0.4489	-0.0996	-0.0796	0.0720
-0.0561	-0.0876	-0.0715	-0.1020	-0.1328	0.0342	0.1036	-0.0650	-0.1457	-0.5644
0.2039	-0.5702	-0.4656	-0.5027	-0.5847	0.0593	-0.0136	-0.4641	-0.5799	-0.8121
-0.0138	-0.2554	-0.0001	0.0980	-0.5513	0.8305	-1.3155	-0.1250	-0.7878	-0.7240
0.8739	0.5190	0.4851	0.7553	0.4193	0.4042	-0.3729	0.5812	0.6127	0.5252
-0.1533	-0.3275	-0.2714	-2.4628	-0.2544	-0.1735	-0.8164	-0.7930	-0.2168	-0.3592
-0.6441	-0.1811	-0.2755	0.3915	-0.2798	-0.3062	-1.7709	0.1691	-0.1522	-0.9311

0.4173	0.0744	0.0273	0.0040	0.1124	0.3736	0.8803	-0.3110	0.0850	0.7485
-0.4905	-0.2151	-0.1269	0.1250	-0.2578	0.0565	0.5691	-0.4182	-0.2907	-0.1840
-1.3369	-0.6208	-0.6842	1.5830	-0.7404	0.1507	-0.8569	0.2133	-0.7602	-1.3963
0.1266	-0.2722	-0.0401	2.0823	-0.2807	-1.0938	0.7174	0.4815	-0.5527	-0.0042
-0.0075	0.1135	0.1904	-0.1854	0.0844	0.0364	-0.4201	0.1852	0.0046	-0.4627
-0.4231	-0.2155	-0.2922	-0.1394	-0.2094	-0.2829	-0.8780	-0.0721	-0.2076	-0.9424

It can be observed that minimum curvature and kriging gave lower discrepancies from the observed data in centimeters and millimeters ranges which are tolerable in surveying and engineering works. But in other methods, the difference in some points are in meters. For example, the modified shepard method had misclosures ranging from 1 to 2 meters which are known to be too high and intolerable in surveying.

Statistical Analysis

Root mean square error was calculated for each method and the result is shown in Table 3. From the RMSE results, minimum curvature gave the least root mean square value (0.2806) which means that on the average, minimum curvature generated heights are errorneous by 0.280m (Forkuo, 2008). Kriging gave a RMSE that is very low too though a little higher than Minimum curvature (0.3108), while the highest root mean square value is seen in modified shepard (0.9099).

Table 3: Root Means Square Error for different methods of contour interpolations

S/N	INTERPOLATION METHOD	RMSE VALUE(m)
1	Minimum curvature	0.280561288
2	Kriging	0.310865356
3	Radial basis function	0.356979
4	Natural neighbor	0.3617
5	Nearest neighbor	0.377381
6	Triangulation with linear interpolation	0.438779
7	Inverse distance to power	0.509658367
8	Local polynomial	0.667918
9	Polynomial regression	0.887015
10	Modified shepard	0.909980786

Elapsed time for gridding data, standard deviation and standard error values were obtained from the grid report for each method used and the results are displayed in Table 4. The result obtained from the elapsed time for gridding data shows that some grid data interpolation methods are faster than the others. The longest expended time is seen in radial basis function method with a processing time of 172.5 seconds while the shortest processing time was recorded by Polynomial regression method (0.02 seconds) which is in agreement with the work of Yang et al. (2004). Modified Shepard has the highest value for standard deviation (7.84684) and standard error (0.094152), while the lowest standard deviation is recorded by Natural neighbor interpolation method (1.98344), and the lowest standard error is recorded by Inverse distance to power method (0.02239).

Table 4: Time elapsed, standard deviation and standard error of each of the interpolation methods

S/N	INTERPOLATION METHOD	TIME ELASPED FOR GRIDDING DATA (seconds)	STANDARD DEVIATION	STANDARD ERROR
1	Minimum curvature	1.10	2.61369	0.02786
2	Kriging	8.33	2.31768	0.02471
3	Radial basis function	172.5	2.40811	0.02567
4	Natural neighbor	0.32	1.98344	0.02850
5	Nearest neighbor	0.16	2.27459	0.02425
6	Triangulation with linear interpolation	0.03	2.00485	0.02848
7	Inverse distance to power	1.01	2.10038	0.02239
8	Local polynomial	1.31	2.54558	0.02714
9	Polynomial regression	0.02	2.73362	0.02914
10	Modified shepard	0.13	7.84684	0.094152

Table 5 shows the coefficient correlation for each of the interpolation method against observed data. The result reveals that they are all closely related, however, the closest relation is seen in minimum curvature and Kriging while the least relation is observed in modified Shepard and polynomial regression methods. Table 6 shows the detailed result of coefficient correlation for all the methods.

Table 5. Coefficient correlation for each method against observed data

	IDP	KRIGING	MC	MSM	NAN	NN	PR	RBF	TWLI	LP
Obs value	.952	.983	.986	.831	.976	.972	.831	.976	.963	.914
N	20	20	20	20	20	20	20	20	20	20

Table 6: Correlation coefficient for all method

		Obs_Value	IDP	KRIGING	MC	MSM	NANE	NENE	PR	RBF	TWLI	LP
Obs_ Value	Pearson Correlation	1	.952	.983	.986	.831	.976	.972	.831	.976	.963	.914
	Sig. (2-tailed)		.000	.000	.000	.000	.000	.000	.000	.000	.000	.000
	N	20	20	20	20	20	20	20	20	20	20	20
IDP	Pearson Correlation	.952	1	.977	.979	.734	.976	.944	.853	.937	.970	.958
	Sig. (2-tailed)	.000		.000	.000	.000	.000	.000	.000	.000	.000	.000
	N	20	20	20	20	20	20	20	20	20	20	20
KRIGING	Pearson Correlation	.983	.977	1	.998	.817	.998	.966	.864	.980	.993	.959
	Sig. (2-tailed)	.000	.000		.000	.000	.000	.000	.000	.000	.000	.000
	N	20	20	20	20	20	20	20	20	20	20	20
MC	Pearson Correlation	.986	.979	.998	1	.819	.994	.967	.858	.979	.986	.954
	Sig. (2-tailed)	.000	.000	.000		.000	.000	.000	.000	.000	.000	.000
	N	20	20	20	20	20	20	20	20	20	20	20
MSM	Pearson Correlation	.831	.734	.817	.819	1	.806	.775	.692	.896	.790	.740
	Sig. (2-tailed)	.000	.000	.000	.000		.000	.000	.001	.000	.000	.000
	N	20	20	20	20	20	20	20	20	20	20	20
NANE	Pearson Correlation	.976	.976	.998	.994	.806	1	.953	.885	.974	.997	.969
	Sig. (2-tailed)	.000	.000	.000	.000	.000		.000	.000	.000	.000	.000
	N	20	20	20	20	20	20	20	20	20	20	20
NENE	Pearson Correlation	.972	.944	.966	.967	.775	.953	1	.787	.943	.945	.894
	Sig. (2-tailed)	.000	.000	.000	.000	.000	.000		.000	.000	.000	.000
	N	20	20	20	20	20	20	20	20	20	20	20
PR	Pearson Correlation	.831	.853	.864	.858	.692	.885	.787	1	.814	.884	.932
	Sig. (2-tailed)	.000	.000	.000	.000	.001	.000	.000		.000	.000	.000
	N	20	20	20	20	20	20	20	20	20	20	20
RBF	Pearson Correlation	.976	.937	.980	.979	.896	.974	.943	.814	1	.965	.909
	Sig. (2-tailed)	.000	.000	.000	.000	.000	.000	.000	.000		.000	.000
	N	20	20	20	20	20	20	20	20	20	20	20
TWLI	Pearson Correlation	.963	.970	.993	.986	.790	.997	.945	.884	.965	1	.969
	Sig. (2-tailed)	.000	.000	.000	.000	.000	.000	.000	.000	.000		.000
	N	20	20	20	20	20	20	20	20	20	20	20
LP	Pearson Correlation	.914	.958	.959	.954	.740	.969	.894	.932	.909	.969	1
	Sig. (2-tailed)	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	
	N	20	20	20	20	20	20	20	20	20	20	20

Scatter graph

Figure 8A-D is the scatter point graph, linear trend line is shown along with the equation of the curves and R^2 statistics for inverse distance to power, Kriging, Minimum Curvature and Modified Shepard method respectively. This analysis was done to further examine how correlated (fitted) the observed heights are close to the interpolated heights from different contour interpolation methods in a graphical form. The scatter plots and the fit line shows that there is positive correlation between the observed height and the interpolated height for all the four contour interpolation methods because the trend is from left side rising towards the right side. The R^2 values measure the strength of fit between the dependent and independent variables. The independent variables are the observed heights while the dependent variables are the interpolated heights. The closer the R^2 value is to 1, the stronger the fitness. From the results in Figure 8A to D, it can be observed that IDP, KRG and MC all have R^2 values above 0.9 (showing close relationship with observed height) while MSM has the lowest value of 0.69. This result agreed with table 5 showing the correlation coefficient ***r*** of each contour interpolation method where MSM has the lowest value of 0.831. The full ***r*** values (coefficient of correlation) are tabulated in table 5. Also, the graph shows

that the points are more clustered along the fit line in IDP, KRG and MC (indicating stronger correlation) than MSM.

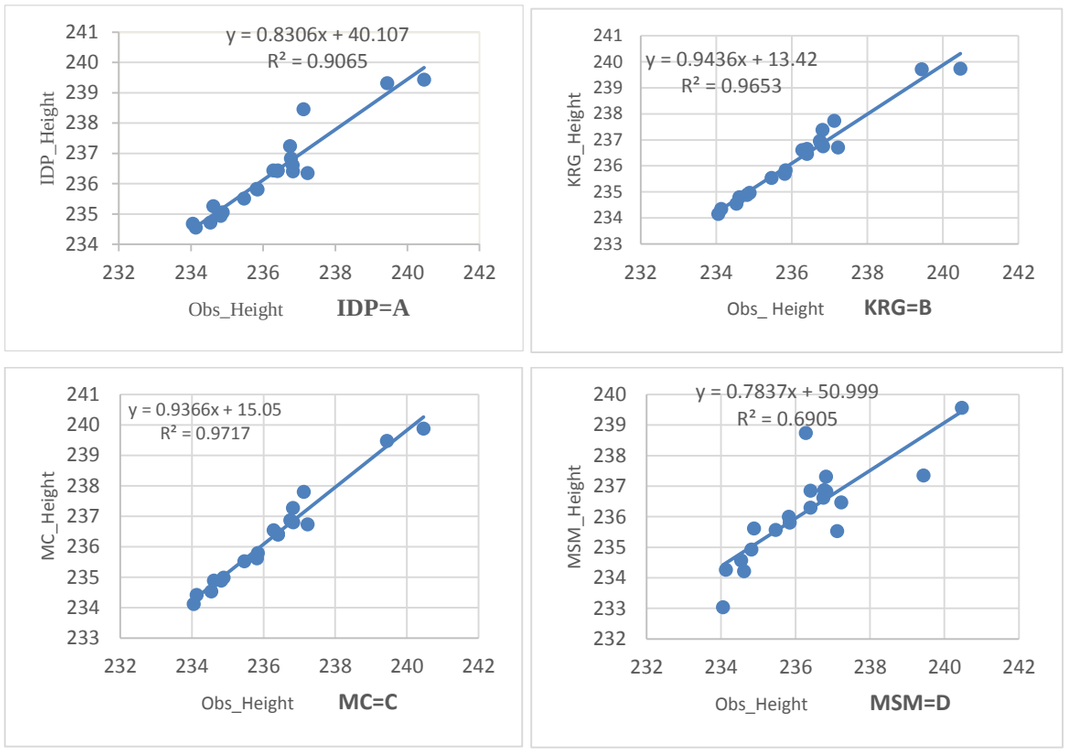


Figure 8: scatter point graph, linear trend line, the equation of the curves and R^2 statistics for Inverse Distance to Power A), Kriging B), Minimum Curvature C), and Modified Shepard method D) methods.

Figure 9A-D is the scatter point graph, linear trend line, the equation of the curves and R^2 statistics for Natural Neighbor, Nearest Neighbor, Polynomial Regression and Radial Basis Function respectively. Just like the results in Figure 8, scatter plots and the fit line shows that there is positive correlation between the observed heights and the interpolated heights for all the four contour interpolation methods. The results show that NAN, NN and BRF all have R^2 values that is above 0.9 (showing close relationship with observed height) while PR has the lowest value of 0.68.The result of correlation coefficient ***r*** in table 5 shows that NAN, NN and BRF have r values above 0.9 while PR has the lowest r values of 0.831. Also, the graph shows that the points are more clustered along the fit line in NAN, NN and PRF (indicating stronger correlation) than PR.

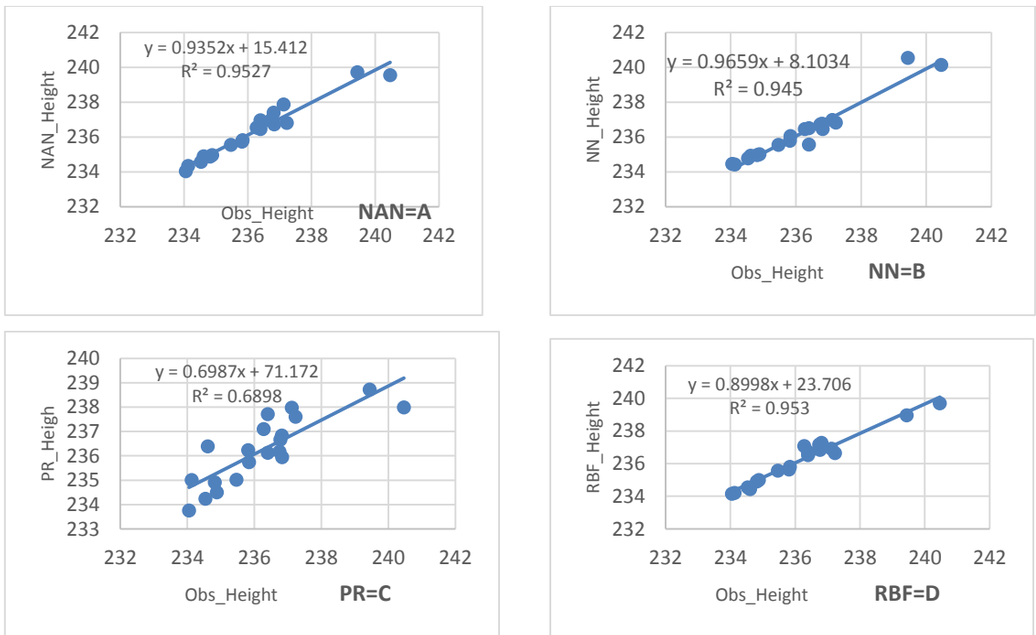
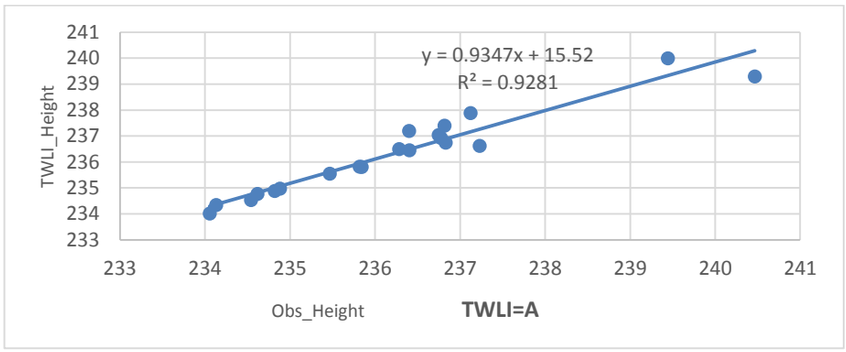


Figure 9: scatter point graph, linear trend line, equation of the curves and R^2 statistics for Natural Neighbor A), Nearest Neighbor B), Polynomial Regression C), and Radial Basis Function D) method.

Figures 10A and B shows the scatter point graph, linear trend line, the equation of the curves and R^2 statistics for Triangulation with Linear Interpolation and Local Polynomial methods

respectively. The scatter plots and the fit line in figure 10 also shows a positive correlation between the observed heights and the interpolated heights for TWLI and LP contour interpolation methods. TWLI has R^2 value that is above 0.9 (showing close relationship with observed height) while LP has R^2 value of 0.84. For correlation coefficient ***r*** in table 5, both TWLI and PL have *r* values above 0.9 indicating strong correlation between observed heights and the interpolated heights generated from the two methods. Also, the graph shows that the points are clustered along the fit line in both methods which indicate strong correlation.



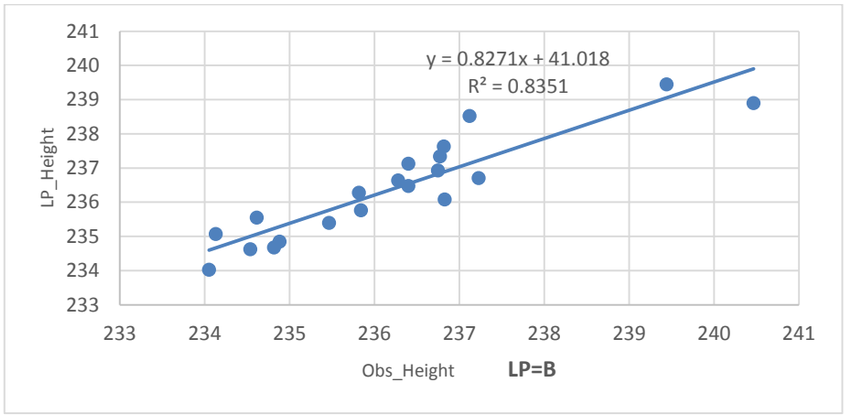


Figure 10: scatter point graph, linear trend line, equation of the curves and R^2 statistics for Triangulation with Linear Interpolation A), Local Polynomial B) method.

CONCLUSION

From the results obtained in this research and their analysis, it can be concluded that minimum curvature and kriging gave the closest estimation to the observed value of the elevation data used. On the other hand, Modified Shepard Method and Polynomial Regression gave the worst estimation to the observed values of elevation data as seen from generated elevation and the results from statistical analysis. It is however important to note that there is no overall best method of interpolation, each method has its advantage and disadvantage and the accuracy for each method depends on the nature of sample data used. Selection of interpolation method should depend on the sample data, expected processing/elapsed time, the type of surface to be generated and tolerance of estimated errors.

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GEOSPATIAL INFORMATION SYSTEMS SOLUTIONS TO THE CONSEQUENCES OF MODERNIZATION AND TECHNOLOGICAL ADVANVEMENTS ON THE BUILT ENVIRONMENT

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Mankind is facing a number of environmental challenges now, mostly due to man's activities within the environment. Most of our built-up areas are faced with environmental problems that adversely affect the inhabitants and the environment as a whole. Modernization and advances in technology largely contribute to the environmental problems. The effects of population pressure, modernization, technological advancements and man's activities on the environment and biodiversity were discussed. Data collected and used include population data, data of environmental problems and data on traffic situation in Minna.The geospatial information is collected using remote sensing technology. Findings show the major environment challenges of the built environment to be pollution and congestion. Some of the solutions are education, information provision and use of modern technology in monitoring and managing the environment. There should be adequate and frequent monitoring of growing urban centers. Recommendations are made as to how to check the processes of environmental degradation, and new technologies and techniques are presented for solving environmental problems of the Built Environment.

Keywords: Environment, Technology, Techniques, Biodiversity, Population-pressure.

INTRODUCTION

Geospatial technology refers to equipment used in visualization, measurement, and analysis of earth's features, typically involving such systems as Global Positioning Systems (GPS), Geographic Information Systems (GIS) and Remote Sensing (RS). Its use is well-known and widespread inclusive of environmental protection. It is also used in law enforcement to locate crimes and for fire response and in disaster management - before, during and after. It is used to locate water resources, or in public health to track the spread of disease. The world is so interconnected today, and everything is based on spatial relationships. Ground breaking applications of remote sensing and geospatial information technology tools are being used for corridor planning decision-making, for relocating railroads or roads, etc. even pipelines.

Aim and Objectives of study

The aim is to highlight the problems of built-up environment and to proffer solutions.

Objectives: The objectives of the study are

1. To determine major problems of the built environment

2. To show the negative effects of modernization and technological advancements on the built environment.

3. To proffer geospatial information systems solutions.

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Problems of the Built Environment

The rapid growth of Urbanization is already causing massive air pollution and environmental degradation – this is a threat to sustainable built environment. A case study conducted in the main built-up area of Nanchang City, (in India) showed noise, smell, dust and hazard as impact factors. In the test areas, noise had a widespread impact; its impacting area accounting for 59% of the total, smell, dust and hazard centralized in the east and south parts.

Here in Minna, the problems include:

i Vehicle traffic congestion

ii Vehicle emissions – pollution

iii Population pressure , inadequate facilities, etc.

The major problems of the built environment generally are:

- Transportation congestion and pollution
- Population pressure – too much human traffic; accommodation and facilities problems
- Crimes and Criminality
- Noise
- Waste disposal
- Inadequate water supply

As the built environment develops, access to clean water, rising levels of air pollution and its consequences become problems. High population growth is also a problem. Modernization and advances in technology largely contribute to the environmental problems. Urban environmental problems include the degradation of urban water, air and land. Environmental problems are typically damages to the physical environment, mostly caused by human beings, and usually with harmful consequences for human welfare, either now or in the future.

This definition (of urban environmental problems) includes:

- Localized environmental health problems such as inadequate household water and sanitation and indoor air pollution.
- City- regional environmental problems such as ambient air pollution, inadequate waste management and pollution of rivers, lakes and coastal areas.

LITERATURE REVIEW

Development any where carries with it environmental consequences that could ultimately negate the goals of the development process. As the built environment develops, access to clean water, rising levels of air pollution, and its consequences become problems (Onuigbo, 2016). A case study was conducted in the main built-up area of Nanchang City, with noise, smell, dust and hazard as the impact factors. The pioneering study applied remote sensing and geospatial information technologies for developing an Environmental Impact Statement (EIS) (Danida, 2000). The rapid growth of urbanization is causing massive air pollution; so also advancements in technology (Onuigbo, 2002).

Osagie (2000), commented in a paper titled, "Sustainability within the context of population and National Resources in Nigeria", that the increase in Nigeria's population since independence almost equaled the total increase during the last century. "It is the yearly increase in absolute numbers that is so critical to Nigeria's prospects for sustainable development. The Technology of remote sensing has developed most rapidly during a time when man has become increasingly conscious of the need to preserve his environment (Wolf, 1974). The origin of emissions can be natural or man-made and from either diffuse or point source. According to Smith, et al, (1997), the main sources of atmospheric emissions are:

- Industry, including power stations
- Landfill sites
- Transport

- Intensive farming,

METHODOLOGY

The research was carried out through some studies and field measurements. The studies and field measurements are summarized and shown in the tables below. Remote sensing has made tremendous impact on man's quest to understand his environment and the impact of his activities on the environment. Remote sensing was used in this research as a solution. Remote Sensing combined with GPS gives access to real- time data.

A study carried out showed the following as the major city-related environmental problems.(Table 1).

Table 1: The table presents a wide range of City-related environmental hazards

S/no	Type of Hazard	Specific example
1	Chemical Pollutants	Air and water pollution and waste from 'cottage' industries and from motor vehicles.
2	Biological pathogens	Overcrowding/ poor ventilation aids transmission of infectious diseases
3	Chemical pollutants	Toxic chemicals, dust…..etc.
4	Land or water pollution from waste dumping	Pollution of land from dumping of house hold industrial/ commercial solid wastes and toxic/hazards wastes. Leaching of toxic chemicals from wastes.

Source: Satterhwwaite, David (1999)

Table 2 shows the population data for several years. This was used to study the effects of population pressure on the built environment and to proffer solutions.

Table 2: Projected National Population, 1990 – 2040 (Population Pressure)

Year	Projected Population	Projected Crude Densities(per Km^2)
1990	85,993,487	92
1995	99,207,942	107
2000	115,224,312	124
2005	133,766,926	144
2010	154,801,325	166
2015	178,575,651	192
2020	205,437,137	221
2025	235,556,077	235
2030	268,813,190	289
2035	304,610,540	324
2040	341,986,340	368

Source: (NPC , 1991)

DISCUSSION AND FINDINGS

The negative effects of modernization and technological advancements:

- Loss of public space - due to developments and congestion.

  Increased traffic has adverse impacts on public activities. More traffic flow influence the life and intentions of residents and their usage of street space.

- Environmental impacts and energy consumption, pollution, including noise, generated by circulation has become a serious impediment to the quality of life and even the health of urban population. Furthermore, energy consumption by urban transportation has drastically increased and so the dependency on petroleum.

- Accidents and Safety. Growing traffic in urban areas is linked with a growing number of accidents and fatalities, especially in developing countries. Accidents account for a significant share of recurring delays. As traffic increases, people feel less safe to use the streets.

- Traffic Congestion. – there are two main problems that modern day cities face, namely urban decay when parts of the city become run down and undesirable to live in, and traffic congestion. Traffic congestion is usually caused by many people working in the city centers which may have narrow streets and shortage of off- street parking which means people park on the roads and so increase congestion – people not using public transport

either because it is less convenient, too expensive or not available. More people now own and use their cars. Severe air pollution comes from exhaust fumes.

- Land consumption – between 30% and 60% of a metropolitan area may be devoted to transportation.
- Nowadays, one of the most important issues in cities is *air pollution.* Without a doubt, the more densely populated a city is, the more air pollution would be brought about. Air pollution as a by- product of human activities has left its finger prints on all aspect of human life. According to health experts, the rates of lung cancer and heart disease have increased rapidly in recent years. In a study performed on two populations of urban and rural area, with 300,000 participants, it was concluded that city-dwellers are two times more likely to suffer lung cancer.
- The devastating issue of air pollution, which is a direct result of urban overpopulation due to rural shift to the cities, needs to be resolved. One solution could be by providing rural areas with better facilities; constructing well-equipped hospitals and creating job opportunities in these regions would encourage rural dwellers to live in these areas.

Findings

1. Population pressure is also contributing to the problems of the built environment. The population is translated to the human activities in the environment and this contributes to the built environment problems.
2. Vehicular traffic emissions are a major contributor to atmospheric air pollution.
3. Some of the solutions to the environmental problems of the built environment are education, information provision, and use of modern technologies in monitoring and managing the environment.

Geospatial Information Systems SOLUTIONS

Remote Sensing and geospatial information technologies are used for Environmental Impact Statement (EIS) / assessment. In transportation, for instance, the applications of geospatial information Systems Solutions are as enumerated below.

A) Transportation

Airborne and Satellite Sensors present a high-resolution, synoptic overview of the highway system, for monitoring assets, reviewing structural integrity, and assessing damage following any unplanned events or service disruptions.

Remote sensing and geospatial information technologies provide tools for enhancing the security of transportation systems. Real- time information on the transportation network through imagery allows agencies to effectively manage traffic and to plan community evacuation and relief operations in case of transportation life line emergencies.

Remote sensing combined with GPS gives access to real- time data. Satellite data is now responsible for over 90% of credible and cost- effective data in use today.

(i) Pioneering UAV demonstrations have shown the ability to collect information on new land uses, traffic congestion, parking lot utilization, and condition of highway signage in urban and rural transportation settings. UAVs can be programmed off-line and controlled in real time to navigate and to collect surveillance data.

(ii) UAVs were successfully tested for following urban and rural transportation routes, tracking moving vehicles, and hovering over junctions of traffic congestion. Geospatial imagery collected by UAVs can help to improve transit and par transit operations management.

Transportation has great influence or impact on our economic development and quality of life.

(iii) Applications of remote sensing techniques and geospatial information systems solutions can be used to deliver smarter, more efficient and responsive transportation services with enhanced safety and security

(iv) Planning a transportation corridor is a high-stakes process. Many potential solutions exist, many variables must be weighed, many viewpoints considered, and costs and benefits analyzed.

The process is expensive and can take several years. Remote sensing and geospatial information technology are providing decision makers smarter decision support tools for application in multimodal corridor planning at significantly reduced cost and time.

(v) Remotely sensed data from airborne and satellite imagery have the advantage of capturing traffic pattern on a wider scale for multimodal transportation management, providing cheaper and more accurate traffic flow measures.

(vi) Airborne and satellite sensors present a high-resolution, synoptic overview of the highway system, for monitoring assets, reviewing structural integrity, and assessing damage following any unplanned events or service disruptions.

(vii) LIDAR can be used effectively in combination with photogrammetry to reduce costs and to provide timely terrain models for entire transportation corridor. Cost savings exceeding 50% are estimated by applying the LIDAR technology.

B) **Fire :** Rapid Evacuation Planning and Disaster preparedness for communities.

Remotely sensed imagery helps to identify the most fire- prone areas and to develop fire propagation models. Detailed neighbourhood maps with microsimulation models allow emergency evacuation to be modeled at the level of the individual vehicle for avoiding congestion during evacuation. Evacuation simulations using road networks and population estimations derived from remotely sensed imagery and GIS database support evacuation planning analysis.

C) Atmospheric Air Pollution

Ground based LIDAR is being used for atmospheric pollution information gatherin, such as the type, concentration and extent of pollutants. There are a number of satellite borne instruments which sample gases within the Troposphere of the Earth's atmosphere (0 – 10 km).

The automatic sensors/analysers are used to monitor air quality (for part of the UK National Monitoring Network) (Smith, et. al. 1997).

CONCLUSIONS

In a healthy environment there is constant and efficient disposal of waste products, both solid and liquid.

One of the major environmental problems of Built – Up area is outdated drainage system of house hold waste water.

Traffic congestion, pollution and noise can be reduced by applying technological advancements.

Population pressure is also contributing to the problems of the built- environment. The population is translated to the human activities in the environment and this contributes to the problems of the built environment.

Geospatial Information Systems Solutions are very essential in solving problems of the built environment.

RECOMMENDATIONS

1. Modern technologies such as remote sensing/ geospatial solutions, should be applied more vigorously in solving environmental problems.
2. We must do everything possible to stem the rate of environmental degradation of the built environment.
3. We must intensify campaign against human activities destroying the built environment.

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EVALUATION OF RAINFALL TREND IN NORTH – CENTRAL REGION OF NIGERIA

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Rainfall trend over areas or regions of the world is one subject area that has received considerable attention of scholars and researchers for various purposes, such as analysis of climate change / variability, agriculture (crop production), water resource management and drought / flood control. This paper examined the pattern of trend in annual rainfall amount, rainfall seasonality and spatio – temporal distribution of rainfall in the North-Central region of Nigeria. Daily rainfall records of thirty years period (1987 – 2016) at six stations in the region, namely; Abuja, Ilorin, Jos, Lokoja, Makurdi and Minna were obtained from the archive of the Nigerian Meteorological Agency (NiMet), Abuja and used for the study. The rainfall data were subjected to statistical analysis using descriptive statistics and moving average statistics to establish the trend. Precipitation Concentration Index (PCI) was employed to evaluate the seasonality, while Mann-Kendal test and Kriging method were used for the spatio–temporal rainfall distribution. The annual rainfall amount experienced in north-central region of Nigeria is between 1100 mm and 1700 mm. The lowest recorded annual rainfall amount of 1181.4 mm was observed at Makurdi and the highest at Abuja (1610.7 mm). The period 1987 – 2016 generally did not show any significant change in trend in annual rainfall total. However, Abuja indicated statistically significant increased trend while Jos and Ilorin showed slight increased trend but statistically not significant. The trend in rainfall amount at Makurdi, Minna and Lokoja indicated no change. Rainfall distribution in the region is neither latitudinal nor longitudinal dependent. This could be largely due to the influence of Jos Plateau. Stations that are located to the west of the Jos Plateau receive higher rainfall than stations at lower latitudes, located to the east of the Jos Plateau. The region generally experienced high rainfall seasonality, as all the stations investigated showed high monthly rainfall concentration.

Key words: Rainfall trend, Variability, Distribution, Seasonality

INTRODUCTION

Rainfall is a climatic/weather parameter that affects almost all aspect of life or the economy. Weather and climate are dynamic in nature and likewise rainfall. They fluctuate and change over time and space. For tropical climate and weather, rainfall is the most variable element (Ayoade, 2004). Long term changes may be taking place which might affect many aspects of human life. Trend in the long term changes need to be established. Trend could reflect either an increase or decrease in the observed phenomenon being investigated and may serve as a good indicator for predicting future occurrences. The understanding of the rainfall pattern or trend and its characteristics over a region is of great importance in agriculture, management of water resources and other sectors of economy, especially in this era of climate change/variability. Climate change, over the past few decades have been fairly rapid in many regions around the world (Lobell and Gourdji, 2012). The IPCC, (2013) Report established that Changes in precipitation will occur across the globe and will not be uniform. Furthermore, that, extreme precipitation events over most of the mid-latitude land masses and over wet tropical regions will very likely become more intense and more frequent. Therefore, the need for an intensified research in this area cannot be over emphasize. Several studies on rainfall trend have been carried out across the globe and are on-going. Woldeamlak Bewket (2009**)** analyzed rainfall variability and trends, and examined vulnerability of food grain production to rainfall variability in the Amhara Region of Ethiopia.

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A country where inter–annual and seasonal rainfall variability is high and droughts are frequent. Rainfall records for 12 stations within the region, for the period 1975 – 2003 and agricultural statistics for the period 1994 – 2003 were used for the study. Various methods analysis of rainfall data, such as characterizing long-term mean values, calculation of indices of variability and trends at monthly, seasonal and annual time step, calculation of the coefficient of variation and the precipitation concentration index (PCI) were used as statistical descriptors of rainfall variability. The least square regression technique was used to quantify trend in annual and seasonal rainfall and the Spearman's Rho test was used to test statistical significance of trend. Standardized anomalies of rainfall were calculated and used to assess frequency and severity of droughts while the monthly rainfall series of all the stations were used to calculate an aerial average rainfall for the region. Correlation and regression were used to examine the relationships between monthly and seasonal rainfall and crop production. Results obtained showed among others that the Seasonal pattern of rainfall in most of the regions is unimodal. The rainfall showed moderate inter-annual variability and rainfall in the region was characterized by alternation of wet years and dry years in a periodic pattern. Studies on rainfall trend in Nigeria has receive considerable attention of researchers.

Obot et al (2010**)** tested for the significant trend in rainfall in Nigeria within a 30 year (1978 – 2007) period using the non – parametric Mann–kendall test and found that total amount of rainfall across Nigeria in selected locations in each of the six geopolitical zones showed an increasing trend of 9.46mm of rainfall per year. The trend was non–existing in a sub 20 years period of 1978 – 1997, but was visible when another sub-period of 1988 – 2007 was examined. In the study, it was also established that minimum rainfall witnessed in a location does not necessarily have to do with the geographical or cardinal placement of that location. In a similar development. Oguntunde et al (2011) evaluated **t**he spatial and temporal patterns of rainfall with a view to improving water management strategies in regions of Nigeria. Rainfall data for the period 1901 to 2000 were employed for the study and analysed using standard test to examine the existence of trend in monthly and annual rainfall in Nigeria; and rainfall variability was estimated as standard rainfall departure. In the work, it was demonstrated that rainfall spatial distribution was highly Latitudinal dependent ($r^2 > 0.09$) and had no clear linear relationship with the Longitude in Nigeria.

Orfega (2014) analyzed the variability of daily rainfall Intensity in Middle Belt region of Nigeria in context of Climate change for a period of 46 years (1961 – 2006). It was concluded that the spatial variations and pattern of daily rainfall intensity generally indicated three (3) enclaves centering on the Jos Plateau; Light rains were increasing on the Jos Plateau and on the Western axis Heavy Rain were also increasing. There are implications from risk of Surface Run off and flooding as well as changing conditions for crop production.

The understanding of the pattern and trend of rainfall and its spatio–temporal distribution, especially in the wake of climate change is critical. The implication of this on agricultural sector, water resource management among others is of economic importance. The aim of the study was to assess the current trend in rainfall in the North–Central region of Nigeria. The specific objectives were to:

1. Analyse the trend in annual rainfall amount;

2. Examine the spatio – temporal rainfall distribution, and

3. Analyse the monthly rainfall concentration/variability in the study area.

The information will serve for policy formulation / planning for sustainable agricultural development, especially now that attention of government is on the diversification of the economy with particular emphasis on the agricultural sector. Thus, it will serve to boost agricultural practice as well as other sectors of the economy, such as water resource management. This work will provide a basis for ascertaining impact of Climate Change or variability within the region and also serve as a guide for IPCC future projections and research into the climate of North–Central region of Nigeria.

The Study Area

North–Central Region of Nigeria comprises of Plateau states (Jos), Benue State (Makurdi), Nasarawa State (Lafia), the Federal Capital Territory (Abuja), Kogi (Lokoja), Kwara state (Ilorin) and Niger State (Minna). These states lie within the Guinea Savannah Region of Nigeria**.** The region experiences two seasons; the dry season and wet/rainy season. The climate is controlled by the meridional oscillation of the Inter-Tropical Discontinuity (ITD).

The ITD is a zone of separation between two air masses, Northeast (NE) trade Winds and South-westerly (SW) Winds. These trade winds prevail over the region and over West Africa in general. In January when the ITD attain its southernmost position at latitude 6^0 N, the region and virtually the entire country is under the influence of NE trade winds. The weather then is dry, cold and hazy, normally referred to as dust haze or the dry season. The SW maritime winds, however, predominates over the region/country with the northward retreating of the ITD attaining its northernmost position at about latitude 22^0 N in August. The region experiences rainy season also known as the summer period.

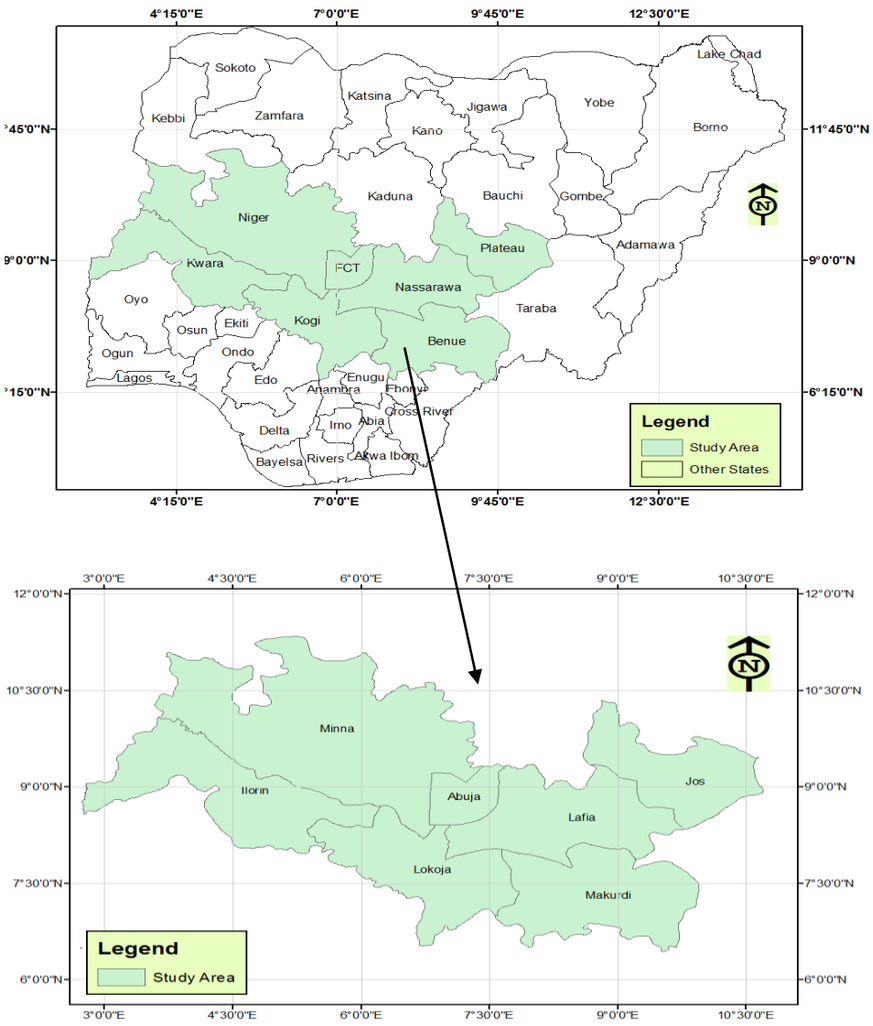

Figure 1.1: The Study area; North – Central Region of Nigeria.
Source: Author's work.

MATERIALS AND METHODS

The data used for this research work were real observed rainfall data over seven stations, namely; Jos, Makurdi, Abuja, Lokoja, Ilorin, and Minna for a period of 30 years (1987 – 2016). Daily rainfall data were obtained from the archives of the Nigerian Meteorological Agency (NiMet). The rainfall monthly and annual totals at the various stations of the study area were computed from the daily rainfall data through cumulative analysis (summation). Other statistical methods employed were the descriptive statistics (mean, standard deviation, and coefficient of variation) and time series analysis was also used to establish the trend in the annual rainfall.

Standard Deviation is a measure of dispersion of a set of sample variables from the mean. This, being a basis for measure of variability, served to collate information on the annual variation of rainfall in all the stations within the region. The formula is given by:

$$S = \sqrt{\frac{n\sum(x^2) - (\sum x)^2}{n(n-1)}} \qquad \text{equation 1}$$

Where S = Standard deviation

x = rainfall amount in a day, in a month or year.

n = number of days in a month or year for which rainfall was measured

Coefficient of variation (C.V) was calculated using the formula:

$$C.V = \frac{S}{\bar{x}} X\ 100 \qquad \text{equation 2}$$

Where $C.V$ = Coefficient of variation

S = Standard deviation

$\bar{x}$ = mean

The temporal trend and spatial rainfall distribution in the study area were examined using Mann – Kendall (MK) test and the kriging method respectively.

Temporal trends in rainfall: The MK test (Mann, 1945; Kendall 1975) is a non–parametric test statistics. The MK rank correlation method was employed at a significance level of 5% to study the temporal trends of annual rainfall amount (A_R) and its coefficient of variability (CV).

Given a rainfall data set of size ($n \geq 10$), mean of zero (0) and a standard deviation of unity (1), and assuming that time series is independent, then MK statistic S, expressed mathematically as:

$$S = \sum_{i=1}^{n-1} \sum_{j=i+1}^{n-1} Sign(X_j - X_i) \qquad \text{equation 3}$$

$$\text{Where } Sign(X_j - X_i) = \begin{cases} 1 & \text{if } X_j - X_i > 0 \\ 0 & \text{if } X_j - X_i = 0 \\ -1 & \text{if } X_j - X_i < 0 \end{cases} \qquad \text{equation 4}$$

X_i and X_j are sequential data for the i^{th} and j^{th} terms

$$Var\ (S) = \frac{n(n-1)(2n+5)}{18} \qquad \text{equation 5}$$

For situation where ties may occur, the $Var\ (S)$ is extended to the form:

$$Var(S) = \left[n(n-1)(2n-5) - \sum_{p=1}^{q} t_p(t_p-1)2(t_p-5)\right]/18 \qquad \text{equation 6}$$

Where q = the number of tied groups

T_p = the number of data values in the P^{th} group

$$Z = \frac{S-1}{\sqrt{VAR\ (S)}} \quad \text{if } S > 0;\ Z = 0 \text{ if } S = 0 \text{ and } Z = \frac{S+1}{\sqrt{VAR\ (S)}} \qquad \text{equation 7}$$

The null hypothesis H_0 for a two sided test is rejected when $|Z| \geq Z_{\alpha/2}$ at a level of significance.

If Z is positive, then the trend is increasing

If Z is negative, then the trend is decreasing

The probability density function (pdf) for a normal distribution with a mean of 0 and standard deviation of 1 is given by:

$$f\ (Z) = \frac{1}{\sqrt{2\pi}}\ e^{-Z_{2/Z}} \qquad \text{equation 8}$$

The value of pdf should be equal to 1 or relatively very close to 1to have a high chance of a significant change occurring.

The function NORMDIST ($|Z|$)is used to evaluate the probability density function on Microsoft excel. For the critical $Z_{\alpha/2}$, the function NORMINV (1 - α/2, mean, standard deviation) was used for evaluating from Microsoft excel, where by the mean is 0 and the standard deviation is unity.

Alpha (α) the level of significance is taken here to be 0.05.

The MK method does not give the rate of change. To estimate the slope of an existing trend that is in the change in rainfall per year, the non parametric Sen's method was used.

Sen's method can be used in cases where the trend can be assumed to be linear. Mathematically, the Sen's method can be expressed thus:

$$x = \text{median}\left(\frac{X_j - X_i}{j - i}\right) \text{ for all } i < j \qquad \text{equation 9}$$

Where X_i and X_j are as defined in equations 3 and 4.

Mann–Kendall rank correlation method is been used in the monthly scale, each month is treated as an individual season in a year and 12 of such monthly series formed the annual series. The slope of the trend is then quantified by a linear regression, given by:

$$Y = mx + c \qquad \text{equation 10}$$

Where y is the rainfall amount (mm),
x is the number of years of the series
m is the slope of the trend indicating the detected change, and
c is a regression coefficient.

Spatial rainfall distribution: The Spatial pattern of the correlations and trends across the region were examined using ordinary Kriging Interpolation method (Miras-Avalos et al., 2007; Yang et al. 2010)

Monthly Rainfall Heterogeneity: the monthly rainfall heterogeneity (concentration or variability) was investigated using the Precipitation Concentration Index (PCI), calculated for each station's recorded length (De Luis, el al, 2000).

$$PCI = 100 \text{ x } \left\{\sum P_j^2 \frac{\sum P_j^2}{(\sum P_i)(\sum P_i)}\right\} \qquad \text{equation 11}$$

Where PCI = Precipitation Concentration Index
P_i = Monthly rainfall in mm
PCI < 10 will indicate uniform monthly rainfall distribution
11 ≤ PCI ≤ 20 will suggest high monthly rainfall concentration
PCI > 20 will suggest very high monthly rainfall concentration

RESULTS AND DISCUSSION

Rainfall pattern

Preliminary investigation of annual rainfall was carried out using descriptive statistics. Table 1 shows the result on the analysis of rainfall amount over the study period. The result revealed that the annual rainfall received in the North–Central Region of Nigeria varies from 1181.4mm (Makurdi) to 1610.7 mm (Abuja). Abuja station located at Latitude (9.25^0 N) received higher annual rainfall (1610.7mm) than stations located at lower Latitudes namely; Makurdi (7 N), Lokoja (6 N) and Ilorin (7 N) which received annual rainfall of 1181.4 mm, 1261.4 mm and 1279.6 mm respectively. The highest rainfall in the region (1610.7mm) recorded at Abuja station is attributed to the strategic location of the station at the windward side of the Jos Plateau, while Makurdi station that is located at the Leeward side of the Jos Plateau received the lowest rainfall (1191.4mm) recorded in the region. Generally, in the region, the rainfall showed moderate inter-annual variability; Ilorin having the highest variability (CV = 30.3%) and Jos the lowest (CV = 11.31%).

Table 1. The Annual rainfall total, maximum and minimum, mean, standard deviation and coefficient of variation in Rainfall in North – Central Region of Nigeria

Variable	Abuja	Ilorin	Jos	Lokoja	Makurdi	Minna
Total Rainfall (1987 – 2016)	48320.4m m	38378.3m m	37045.2m m	37842.2m m	35441.4m m	36774.0m m
Maximum Rainfall	1198.3mm	2552.6mm	1582.7mm	1767.1mm	1617.1mm	1547.4mm
Minimum Rainfall	2157.6mm	727.7mm	814.7mm	931.5mm	761.5mm	818.4mm
Mean ($\bar{x}$)	1610.7mm	1279.6mm	1234.8mm	1261.4mm	1181.4mm	1225.8mm
Standard Deviation	279.8	393.4	141.6	233.1	206.5	156.6
Coefficient.of Variation (CV)	17.1%	30.3%	11.3%	18.5%	18.5%	12.6%

Trend analysis of annual rainfall

Analysis on trend in annual rainfall was carried out using five years moving average. Figure 1 shows the trend of annual rainfall amount at the six stations (Abuja, Jos, Makurdi, Ilorin, Lokoja and Minna) in the north-central region of Nigeria. At Abuja station (Figure 1a), the result revealed an increase in rainfall trend which implied an increase in rainfall amount for the period of study. The year 2007 recorded the highest amount of rainfall (2013mm) and the lowest rainfall amount was recorded in 1999 (1408mm). The period from 2000 to 2013 experienced high rainfall. A slight increased trend in annual rainfall occurred at Ilorin station (Figure 1d). The rainfall amount was on the increase, the lowest recorded rainfall was in 1990 (1022.9 mm) while the highest rainfall was recorded in 2014 (1780.2 mm). Similarly, there was slight increase in trend of rainfall amount at Jos (Figure 1b). The period from 1990 – 1999 recorded low rainfall, the lowest being in 1993 (1128 mm) while from 2000 – 2012 high rainfall was experienced with the highest amount (1315.5 mm) recorded in 2010. Annual rainfall trend at Makurdi, Lokoja and Minna (Figures 1c, 1e & 1f, respectively) indicated no significant change. However, the annual rainfall amount at the three locations was generally above 1100 mm. At Lokoja, the highest rainfall amount of 1410.1mm was recorded in 2008 and the lowest being 1103.3mm in 2003. At Makurdi station, the period from 1998 – 2004 witnessed decreased rainfall while at Minna the rainfall amount was quite high over the years, well above 1100 mm and increases. The lowest amount (1210.4 mm) was recorded in 1990 and the highest rainfall amount (1315.3 mm) in 2008.

Generally, the time series analysis revealed that rainfall trend in North – Central Nigeria shows some characteristic increase in places like Abuja, slight increase at Ilorin and Jos and no significant change at Makurdi, Lokoja and Minna. However, the rainfall was observed to increase at Minna for the period from 1990 – 2016 while at Makurdi it was seen to decrease from the period 1988 – 2016.

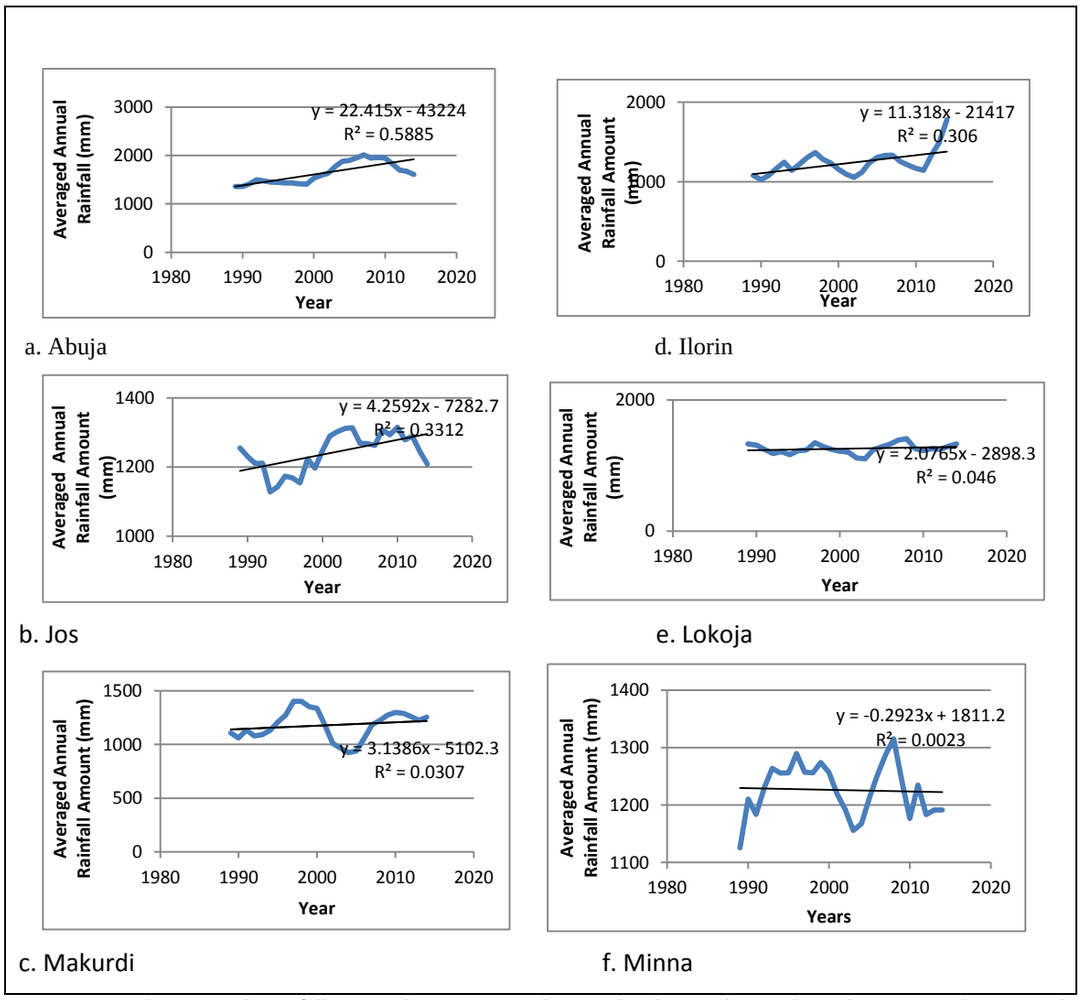

Figure1. Trend in annual rainfall over Abuja (a), Jos (b), Makurdi (c), Ilorin (d), Lokoja (e) and Minna (d) stations in North – Central Region of Nigeria for 30 years period (1987 – 2016)

Temporal trend

The Temporal trend of rainfall amount in the study area was examined using the Mann–Kendall's test, based on rank correlation. The outcome of the MK test is presented on Table 2. The results showed a trend in temporal rainfall similar to the trend revealed by the five – year moving average at all the stations under study. The pattern of rainfall in Abuja and Ilorin is at the increase as verified by these two tests (five – year moving average and Mann-Kendall tests) carried out. If this trend should be sustained over time it would on one hand improve agricultural production and meant good for water resource management. On the other hand, increased severity in rainfall could pose serious dangers such as flooding. Jos station which indicated slight increased trend in time series analysis showed an insignificant change by the Mann – Kendal test statistics (R = 0.030). The other three stations (Makurdi, Lokoja and Minna) show no significant change in trend by the Mann – Kendall tests. However, there is tendency for Lokoja to experience a decreasing temporal trend in rainfall (R = - 0.015; the Sen;s slope is also negative: - 1.049).

Table 2. Mann-Kendall's trend test ($\alpha = 0.05$)

	Abuja	Ilorin	Jos	Lokoja	Makurdi	Minna
Kendall's tau	0.409	0.300	0.030	- 0.015	0.138	0.030
S	163.000	122.000	12.000	- 6.000	56.000	12.000
p-value (Two-tailed)	0.002	0.023	0.837	0.925	0.302	0.837
Sen's slope	21.503	16.118	0.737	- 1.049	5.281	0.653

Spatial Rainfall Distribution

Analysis of the spatial distribution in rainfall in the study area was carried out using ordinary kriging Interpolation method through the aid of Surfer software. The result is presented in Figure 2. The result revealed that rainfall distribution in north – central Nigeria is not Latitudinal, neither Longitudinal dependent. Stations further north received higher rainfall than stations to the south, by virtue of their location relative to the Jos plateau. For instance, Minna (9.25^0 N 7.43^0 E) located to the West of the Jos Plateau recorded 1225.8mm mean annual rainfall which is quite higher than the 1181.4mm mean annual rainfall recorded at Makurdi, positioned at Latitude 7.25^0 N 8.43^0 E which is to the east (Leeward) of the Jos Plateau. Likewise, Abuja station, which by virtue of its strategic location at the windward of the Jos Plateau receive higher rainfall (1610.7mm) than stations such as, Ilorin (1279.6mm) and Minna (1225.8mm) which are located to the south at7.25^0 N 8.43^0 E and 7.25^0 N 8.43^0 E respectively.

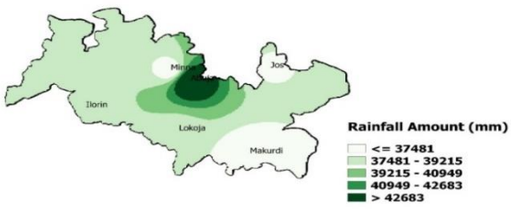

Figure 2. Spatial rainfall distribution over Abuja, Jos, Makurdi, Ilorin, Lokoja and Mina stations in North – Central Region of Nigeria for 30 years period (1987 – 2016)

Rainfall heterogeneity

Analysis of the rainfall seasonal variability was carried out using the Precipitation Concentration Index (PCI) for all the six stations under study. The Normalized Precipitation Concentration Index (NPCI) was used to examine the annual rainfall variability. The results for the station are presented in Table 3. The results showed that the PCI values range between 11 and 20 at all the stations and for almost all the years under study. This means that rainfall seasonal variability was high. That is, there is high monthly rainfall concentration. Only three years out of the entire period of study indicated PCI values greater than 20, which mean a very high monthly concentration. The years are 1999 at Jos (PCI = 20.2), 2003 at Ilorin (PCI = 20.8) and 2009 at Mina (PCI = 21.9). Generally, the calculated PCI shows that rainfall

in North–Central region of Nigeria is characterized by high monthly rainfall concentration. This implies is that all the months of the rainy season had high concentration of rainfall. This means availability of moisture for crop production.

In the same vain, results of the normalized PCI indicated that high annual rainfall variability was experienced in the region during the period of study.

Table 3: Values of Precipitation Concentration Index (PCI) at Abuja, Ilorin, Jos, Lokoja, Makurdi and Minna stations in North – central Region of Nigeria for the period 1987 – 2016.

Year	Precipitation Concentration Index (PCI) values					
	Abuja	Ilorin	Jos	lokoja	Makurdi	Minna
1987	19.8	17.5	19	15.9	21.7	17.3
1988	14.9	13.4	14.9	18.1	15.9	21.1
1989	15.2	15.5	18	16	15.9	16.4
1990	15.1	15.5	18.7	15.9	17.2	15.2
1991	15.9	15.5	16.7	14.7	15.3	17.6
1992	14.7	18.1	17	16.7	18	15
1993	16.3	14.6	17.8	14.6	18.7	17.9
1994	19.6	15.1	17.3	15.7	15.5	17.2
1995	18.5	12.8	18.7	14.7	19.3	17.8
1996	16.3	13.5	16.1	16.5	16.2	16.4
1997	14.4	15.7	15.1	16.3	16.8	15.4
1998	16.2	15.7	20.2	16.2	16.5	15.6
1999	15.9	13.6	15.8	16.9	16.4	16.6
2000	17	17.8	17.9	15.8	17.7	18.4
2001	18.4	16.8	18.8	17.9	17.8	18.3
2002	18.5	16.2	18.1	17.3	16.2	16.7
2003	16.8	20.8	16.5	18.6	17.4	16.7
2004	13.5	15	17.5	15.5	15.6	17.2
2005	14.5	14.8	17.9	14.4	16	17.9
2006	15.4	14.5	16.9	16.8	16.9	17.6
2007	14.3	15.1	18.6	15.1	15.1	17.5
2008	15.4	17.4	16.8	16.7	17.8	17.8
2009	12.6	15.7	15.7	15.4	15.8	21.9
2010	13.5	14.9	16.3	15.4	17.5	16.3
2011	15.6	16.8	17.1	15.4	17.6	18.7
2012	13	14.2	19.2	15.5	15.1	18.7
2013	16.1	16	17.5	13.9	14.8	16
2014	12.9	15.1	15.5	13.5	16.1	17.4
2015	17.2	17	18.9	14.4	16.8	19.2
2016	15.4	14.7	18.6	17.1	16.2	19.7

CONCLUSION

The trend in annual rainfall in the north – central region of Nigeria in the last three decades vary from place to place. Three stations: Makurdi, Lokoja and Minna, show no significant trend; two of the stations (Ilorin and Jos) indicated slight increased trend in annual rainfall amount and only one; Abuja indicated a statistically significant increased trend in the annual rainfall amount. However, the mean annual rainfall received at the region was generally between the range of 1181.7mm (Makurdi) and 1610.4mm (Abuja). Generally, in the region, the rainfall showed moderate inter-annual variability; Ilorin having the highest variability (CV = 30.3%) and Jos the lowest (CV = 11.31%). While the monthly variability was high, which imply seasonality. The high monthly rainfall concentration means availability of moisture and would promote crop production. In terms of rainfall distribution, latitudinal influence did not come into play. The Jos Plateau play significant role in rainfall distribution within the north – central region of Nigeria with high rainfall recorded at the windward side of the Plateau.

RECOMMENDATIONS

1. It is recommended that further investigation be carried out on rainfall pattern and its distribution in the north – central region of Nigeria, the role of the Jos Plateau and the implication on agriculture in the region.

2. There is the need also to carry out study on other rainfall characteristics and their impact on ecosystem of north – central region of Nigeria, including investigation of rainfall extremes, particularly heavy rains to avoid associated risk of flooding that could adversely

affect agricultural output, especially with the high monthly rainfall concentration observed in the study area.

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A REVIEW OF GEOGRAPHIC INFORMATION SYSTEMS APPLICATIONS TO ELECTION MAPPING IN NIGERIA

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Elections are the major hallmark of democratic societies and many countries have begun applying Geographic Information Systems (GIS) to manage the electoral process. GIS is also being utilised by political parties to assess the dispositions of voters and determine where to focus their campaign efforts. In a GIS, a combination of thematic layers of administrative areas such as population and land use can yield meaningful relationships or scenarios critical to decision-making processes and this makes it an exceptional tool for the management and analyses of elections at all stages. Nigeria's national electoral body, the Independent National Electoral Commission (INEC) has not been very proactive in leveraging GIS and Information Technology for ensuring hitch-free, free and fair elections in the country. GIS is key in enforcing the transparency of this system. This paper reviews the deployments of GIS for election mapping in Nigeria and discusses their applications in Nigeria's electoral system. The study shows that the status of GIS applications for electoral mapping in Nigeria is still in an infancy stage. The critical turning point lies in the full exploitation of GIS by the government's electoral apparatus.

Keywords: INEC, Polling Units, GIS, WebGIS, Nigeria

INTRODUCTION

One hallmark, critical to a functional democratic society are elections and its processes (Igbokwe-Ibeto *et al.*, 2016). According to Mesfin (2008), elections are prerequisites for any democracy, considered as the founding pillars of any democratic political system, whether considered fragile or established. It is a key component of political developments, which largely shapes a nation's socio-economic growth and development. An electioneering process is one which requires that an organised institution is saddled with the responsibility of organising, supervising and managing the nomination and subsequent election of aspiring individuals into various capacities (Egbala, 2014). In most established democracies, elections are routine processes, whose credibility is usually subjected to a list of factors. According to Elklit and Reynolds (2005), some of these factors include defective ballots, incomplete voter registers, inaccuracies in counting, impersonation and other blemishes. They also maintained that, human error happens sometimes, but if these errors are random and do not accumulate to determining the outcome of the election, then electoral credibility survives.

The standards for defining the measure of electioneering success or otherwise, is one which has benefited from contributions of the Inter-Parliamentary Union (IPU), with the aim of ensuring electoral quality (Boda, 2004). However, till date, there is still no general consensus on the terms defining 'Free and Fair elections'. As such, for the purpose of effective electioneering management, elections and its procedures are usually enshrined in a country's constitutional document, as a means of binding legal legitimacy. The term 'Election', however lacks a universal definition as stakeholders and different countries lean towards definitions in conformity with their democratic systems.

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As reported by Mesfin, (2008), two important factors on which the choice of an electoral system depends, includes: the identity of the State, characterised by sociocultural, historical, geographic, economic and political conditions and the prevailing political system in place. Nigeria, located in Western Africa on the Gulf of Guinea has always had turbulent elections. Past elections have been characterised by a number of irregularities ranging from imposition of candidates at party primaries, intra-party conflicts, political manoeuvres, manipulations of election results, disenfranchisement of eligible voters, thuggery and rigging, multiple registration of voters, and multiple voting (Nwagwu, 2016). The last presidential election in the country was held from March 28 – April 1, 2015. The 2015 elections were in many ways different from previous elections as the incumbency lost by a relatively wide margin of the total votes cast (CPPA, 2015). Nigeria's electoral administration hierarchy includes 774 Local Government Areas (LGAs), 360 Federal Constituencies, 91 Senatorial zones, 36 states and 1 Federal Capital Territory (Omoleke and Maduekwe, 2017). Figure 1 presents the administrative map of Nigeria. This system also includes sub-national electoral structures like State Constituencies and Councillorship Units located at the States and LGAs respectively.

The level of application of GIS to the Nigerian electoral system is very low. There is little evidence in the existing literature to show that there has been a systematic and thorough application of GIS in Nigeria's election system by the election management apparatus of Federal and State Governments in Nigeria. The few attempts made by INEC appear to have yielded mostly short-term deliverables. This is not unconnected with the trend in the Nigerian system of government which suffers from discontinuity in policies and development plans between successive governments. This situation is aggravated in the electoral process because key electoral officers are sometimes hampered from following through with implementation of digital technologies due to their untimely dismissals or redeployments caused by the massive distrust involved in electoral matters. There is also the problem of inadequate or poorly referenced geographic data to support electoral mapping with GIS. A lot of times, geographic data on Nigeria from internet databases are more detailed than what is available from mapping agencies in the country. Therefore, this study reviews the status of GIS applications for elections mapping in Nigeria with the aim of establishing a valuable knowledge base to inform stakeholders and researchers alike.

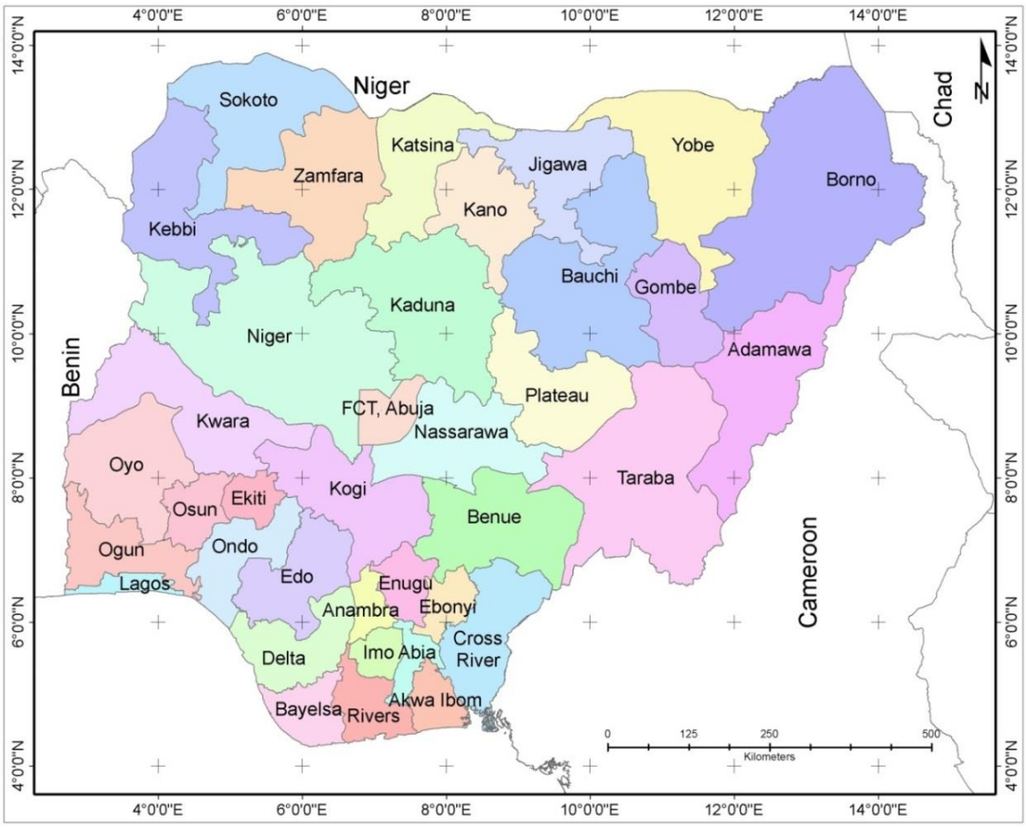

Figure 1: Administrative map of Nigeria (Source: Author)

Geographic Information Systems

Estimates have it that about 70-80% of all the information we deal with has some form of geographical (spatial) content. Many professionals have recognised the importance of this

spatial dimension in managing and analysing information and there is an increasing awareness about its importance in the larger society. Geographic Information (GI) combined into an Information System gives rise to what is termed as Geographic Information System (GIS). Basically, an information system consists of a database being managed by a Database Management System (DBMS), and a set of tools for manipulating and analysing this data (Zehnder, 1989; Bartelme, 2012). Innovations in information and communication technology plus fast-paced technological developments have broadened the frontiers of GIS application. As Longley *et al.* (2010) rightly state: "the modern history of GIS dates from the early 1980s, when the price of sufficiently powerful computers fell below a critical threshold". A GIS is generally accepted to be a system for capturing, storing, checking, manipulating, analysing, and displaying data that are geographically referenced (Deakin, 2009). Its emphasis is on spatially distributed information and it is normally considered to involve a spatially-referenced and structured digital database, and appropriate applications' software (Nwilo, 1998; Kufoniyi, 1998). GIS introduces a perspective, which provides valuable insights such as the ability to assimilate divergent sources of data both spatial and non-spatial (attribute data), visualisation impact, analytical capability, and sharing of information (Akeh and Mshelia, 2016).

GIS for Elections Mapping

GIS incorporates adequate visualisation of map results and with a web-based and real time monitoring system of the elections, results can be easily displayed and made available to the public immediately the elections are over and at real-time. Electoral administration and governance matters like monitoring by electoral observers, determination of and siting of polling units, movement of election materials, collation and dissemination of election results etc. have geographic footprints. Thus, Geographic Information Systems can be deployed to provide solutions to some of the major challenges. GIS-derived maps make great use of digital technology in the process of their creation, and their great potential to get new perspectives on the world using highly advanced techniques can only be exploited because of advances in digital technology (Okolie, 2018).

GIS technologies have been applied in recent elections, for example, to view voter turnout and determine where politicians should focus their efforts (Hanewicz, 2012). The power of a GIS lies in the fact that thematic layers for key geographic areas being represented can be used to create multidimensional views of such areas over time. This means that when it comes to the management and analyses of elections, GIS is an exceptional tool that can be used in a better management process at all stages of an election. In the 2015 elections in Nigeria, a lot of problems were reported in the news media such as incomplete voters' registration, low election turn-out, underage voting, hijacking of ballot boxes, multiple thumb-printing, contention over increase in polling centres across the country, and manipulations of votes in rural areas (Akintoye, 2015). The incidence of some of these problems would have been reduced if an effective GIS was in place. For example, a Nigerian citizen that is eligible to vote must carry out some key activities before the actual election day. Such a citizen must first locate his or her polling unit. Then the citizen must go to the polling unit to register, with pictures and details taken at the registration point. A voter ID card is issued to the citizen and this makes the person eligible to vote on the actual election day. This voters' registration process is very time-intensive and this is one area where GIS can be useful. GIS will help minimize the time-consuming process.

When there is a robust GIS in place for the states in the country, the voters can locate the polling units via a web and a mobile based GIS platform without actually being in the locations physically. The intelligent maps produced from the GIS can aid in planning and research, direct knowledge (distance and direction search/points and area of interest search), access to hidden facts, exploration, exploitation and management of resources (Akintoye, 2015). With internet-enabled devices such as laptops, desktops and even smartphones, voters can easily and instantly find their geographic location in relation to the electoral map created for the state and they can use this to locate their polling stations in the area with ease. With the creation of key geodatabases when developing the GIS, voters can be provided with direct access to the registered voters' database, which displays all information about the voters as provided during the registration process. With this in place, voters can authenticate as well as validate their voter records and take corrective action if necessary before the voting exercise. This in turn will facilitate the effective deployment of polling personnel such as polling officers, staff, security officers and others to manage the election process efficiently, since number of voters, voter registration, age, and other demographic information have been

adequately acquired. Electronic voting (if carried out) can also be better handled and monitored because of the GIS in place.

GIS serves as a backbone to aid election officers to manage their jurisdictions as well as coordinate operations. It also provides the following analytical capabilities: data processing, computational operations, modelling caapbilities, thematic mapping, spatial analysis, and generation of new data (Okolie, 2015). Due to the fact that there is a GIS with an electoral map in place, the voting exercise carried out on the actual election day can be well monitored and managed. With a collection of algorithmic and functional tools within the GIS (Bartelme, 2012) and a web-based GIS interface in place, election officers can have access to a highly-sophisticated GIS application, making it possible to perform a wide range of duties and responsibilities. Live video broadcasting and viewing of the entire voting process of a polling station can be carried out by selecting the polling station located on the web-map. This is due to the fact that in addition to linking information about voters and images, videos and more can be linked to the electoral map in the GIS application, thereby providing the electoral officers with the responsibility of monitoring and supervising the accreditation and voting exercises at real-time. This provides easy coordination of elections; better monitoring process and officers are able to take decisions swiftly and confidently due to the availability of real time data from polling stations. After elections, results obtained can be more transparent due to automatic map visualisation of election results that a GIS can provide. Election maps and spatial representations with results embedded in them can be provided as soon as elections are concluded to the automated process. Spatial analysis of multiple databases can aid the provision of better visualisation of results down to the state and local government levels.

WebGIS Tools for Election Mapping

A WebGIS application is an application of GIS which one can access online via the internet (Purwonegoro and Windiastuti, 2014). The configuration of a WebGIS includes three tiers (Fu, 2012): the data tier (GIS database server), the logical tier (GIS server and web server), and the presentation tier (client - web browser, desktop or mobile). In this case the user/client can use any internet browser to access GIS information on the server. Voting has changed over the years. The technological process of administering elections has changed a lot. Hence, with the provision of a WebGIS application, maps can be accessed at real time and used for various electoral spatial and attribute analyses by electoral officers. With the required tools in place, such a system will aid the monitoring of the distribution of logistics for the election and authorities including general communities who may need the information can easily obtain this with permission from the Electoral Commission (INEC). A WebGIS application also provides the following functionalities - users can reach the whole world wide, at a fairly low cost; users do not need special software and tools; it can present an interactive map in the similar manner as desktop GIS software; and it is independent of the computer operating system (Purwonegoro and Windiastuti, 2014).

There are many WebGIS applications that can aid transparency in elections in Nigeria. These cuts across the use of existing applications provided by GIS software vendors to open-source software and even down to the development of customised applications for the election exercise. These tools are provided to not only meet the needs of the electoral officials but also the needs of the citizens that are engaged in the voting process on that very day of election. When it comes to WebGIS applications, there are certain tools that are required to perform processes beyond mapping. These tools consist of different types, ranging from finding an address to very more specific tools for calculating best routes and finding nearest facilities. These kinds of WebGIS tools will definitely be required in an electoral process of the country. These can be described in the following ways:

1. Many web GIS applications include software functions to perform GIS analysis and this comes with tools that can visualise and analyse the election map results. There can be a series of tools to chart, analyse, and understand the election results on a real-time basis via the web platform. This could come in the form of map result classification, statistical summaries and the generation of tabular results and graphs. This will make election transparency possible.
2. Electoral officers such as the Nigerian Independent National Electoral Commission (INEC) officials require a series of focused tools that help them accomplish their workflows and assignments. For example, tools to edit the electoral map, monitor elections and analyse the database can be of great use to them. This they can do at

almost any given location provided there is internet connection for the work process to be carried out.

3. Many end users or citizens will require designated layers on the platform with typical tools for their own use. Citizens can use the platform for finding polling units assigned to them. Registered voters can easily claim their voter records and even correct any inconsistencies by interacting directly with the WebGIS platform. They no longer need to go through polling agents and other non-governmental support staff to do this. This enhances transparency.

Distributing geographic information on the internet is an enforcing factor for information providers. Internet allows all levels of society to access geographic information, and provides a media for processing geo-related information with no location restrictions (Alesheikh *et al.,* 2015). This shows that with the provision of a robust WebGIS application and its tools, voters and election officers can be more involved in and well informed of the election process thereby encouraging transparency from start to finish of the electoral exercise. A good example is the Ushahidi election monitoring tool. Ushahidi has been used to monitor elections around the world, from Nigeria and Mozambique, to the Unietd States of America (Manning, 2016). Figure 2 shows the interface of the Ushahidi platform used to monitor the United States (US) 2012 elections.

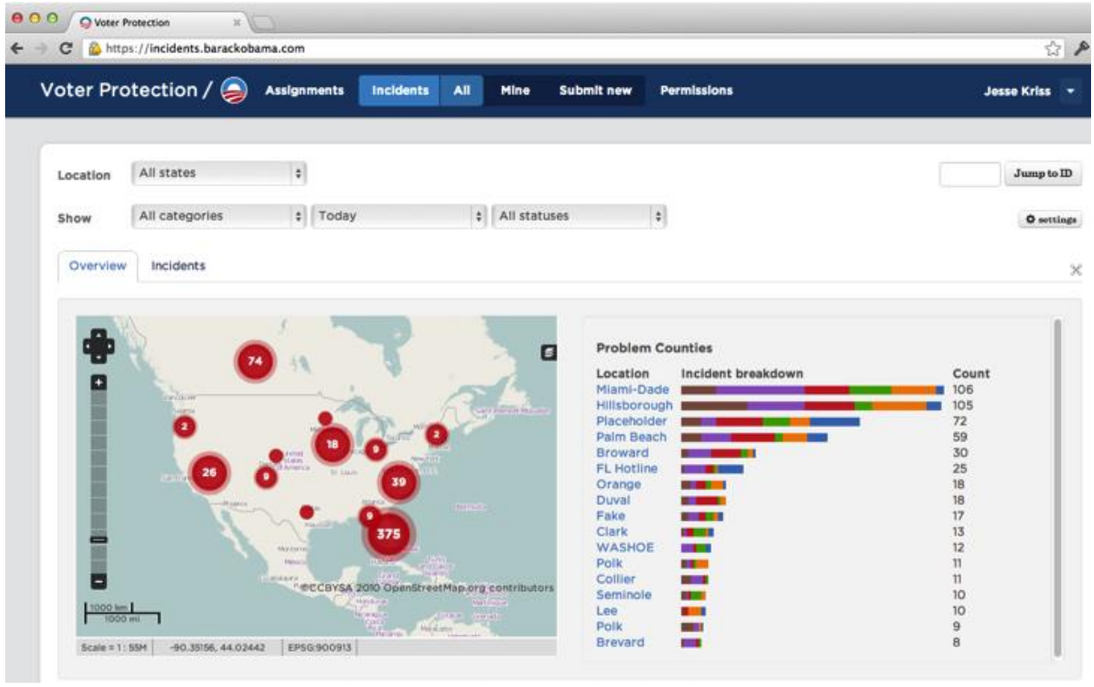

Figure 2: Monitoring the US 2012 elections with Ushahidi (Source: Manning, 2016)

Status of GIS Applications to Elections in Nigeria

ESRI (2007) reports that Nigeria's Federal Electoral body, the Independent National Electoral Commission (INEC) employed GIS to inventorise and spatially locate 120,000 polling units scattered across the country. In the mapping, Global Positioning Systems (GPS) digital photography and Database Management Systems (DBMS) technologies were integrated to create a data collection tool capable of capturing the coordinates and images of existing polling units. The result was a PUGIS (Polling Units - GIS) that could display polling units within two levels of administrative boundaries (state and local government areas), and the proposed registration areas; and also capable of executing simple GIS queries. More recently in 2014, the Office of the Surveyor General of the Federation (OSGoF) produced for INEC hundreds of satellite image maps showing the locations of Polling Units (Pus) in the country. The satellite imagery used was the 2.5-metre SPOT natural colour imagery which had recently been delivered to OSGoF by Infoterra, United Kingdom. Figure 3 shows an image map for a part of Kano State. INEC has also embedded maps on its website (http://www.inecnigeria.org/) showing the locations of polling units on its website (Figure 4). In addition, a PU locator on the site assists individuals in locating polling units in each state up to the ward level.

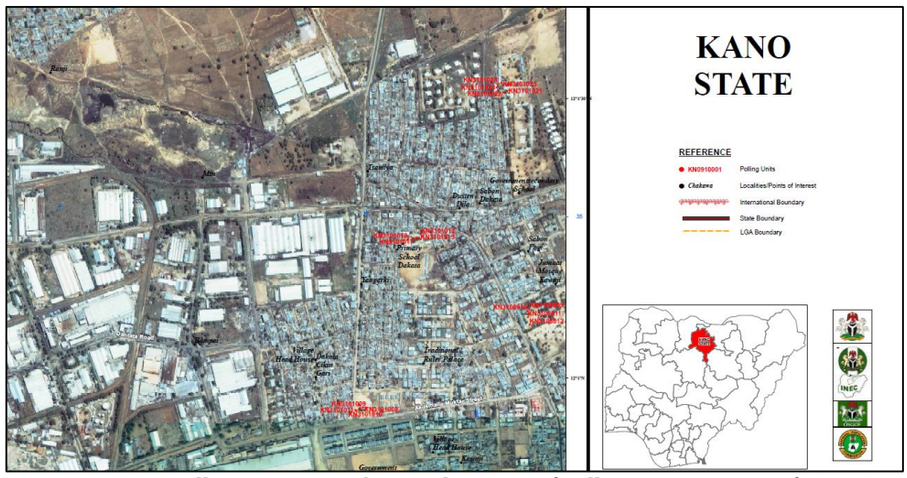

Figure 3: INEC Satellite image map showing locations of polling units in a part of Kano State (Source: Author)

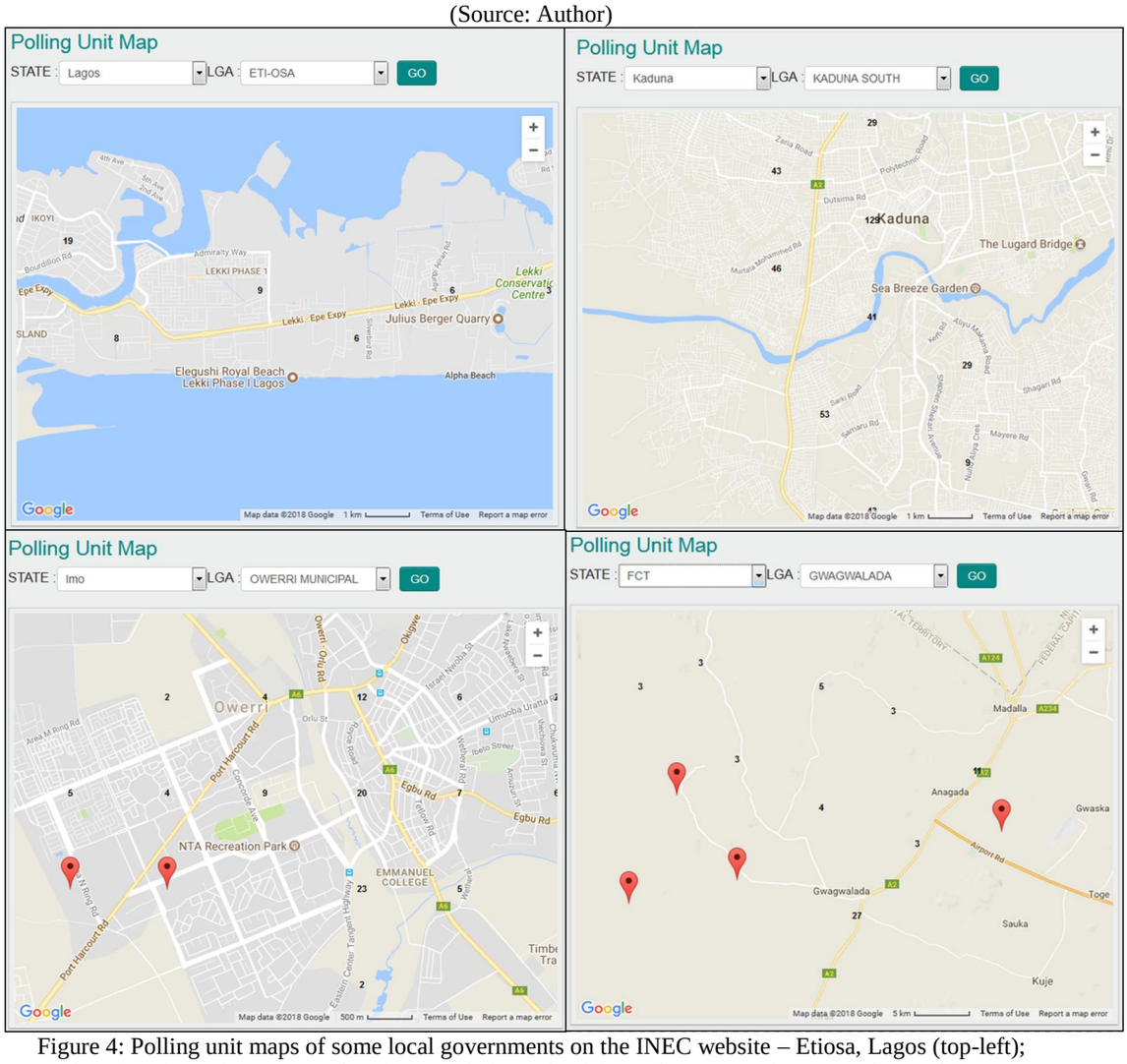

Figure 4: Polling unit maps of some local governments on the INEC website – Etiosa, Lagos (top-left); Kaduna South, Kaduna (top-right); Gwagwalada, Federal Capital Territory (bottom right); and Owerri Municipal, Imo (bottom left) (Source: INEC, 2018)

Other organisations have employed WebGIS and crowdsourcing tools to provide incident reports and monitoring of elections in Nigeria. For example, in the period leading to the 2015 elections, the technology company, Ushahidi partnered with the Stakeholder Democracy Network (SDN) and other stakeholders to create an early warning dashboard for violence in the run-up, during and immediately after the elections (Ushahidi Staff, 2015). Previously, during the 2011 elections, the Ushahidi powered Niger Delta Watch website was used to monitor events and highlight human rights abuses and forced evictions. To help track early warning signs of election-related violence in the 2015 elections, a non-profit group, Search for Common Ground (SFCG) used a system that combined information from long-term election observations; crowd sourced data and media reports to identify trends and hotspots of violence in the run-up to the elections (SFCG, 2018). A product of the collaboration was an online crowdmap of election-related violence called the Nigerian Electoral Early Warning

System (NEEWS) (Figure 5). NEEWS provided a mechanism to monitor early warning signs and incidents of electoral violence in the run-up to the 2015 elections.

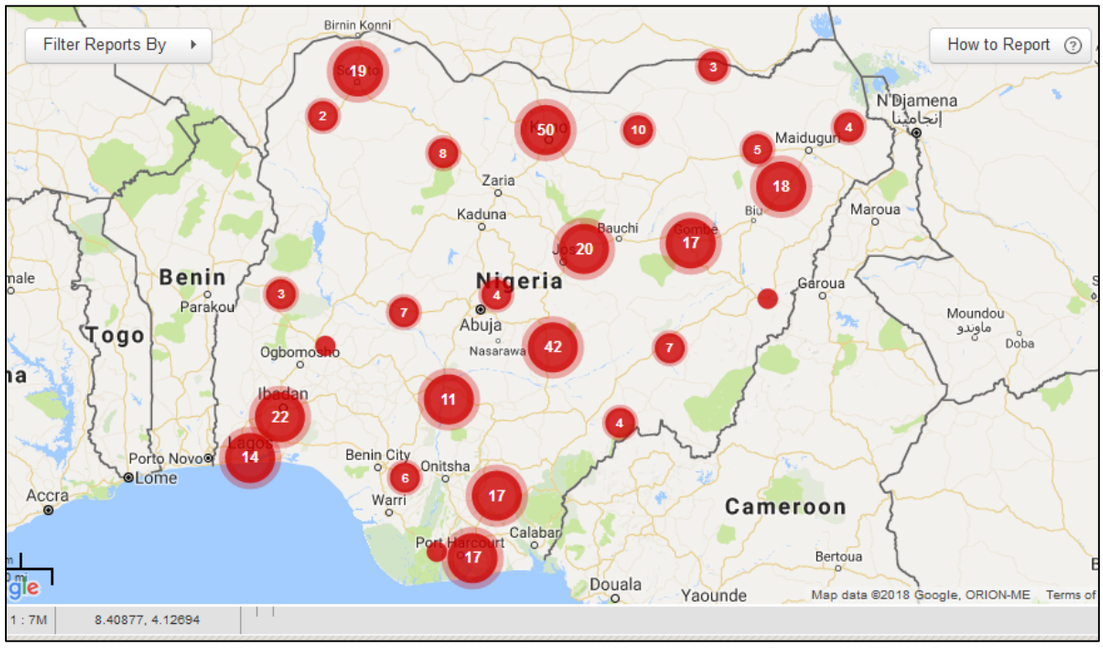

Figure 5: The interface of the Nigerian Electoral Early Warning System - NEEWS (Source: SFCG, 2018)

In another effort, Connected Development (CODE) deployed an Ushahidi powered platform called Uzabe (http://uzabe.org) to create a web map for observing the 2016 Federal Capital Territory municipal elections (Figure 6) and the 2017 gubernatorial elections in Nigeria (Figure 7). Uzabe incorporates tools for collecting situation reports form observers. The thematic layers on the map include categories for ballot issues, polling station issues, security issues etc.

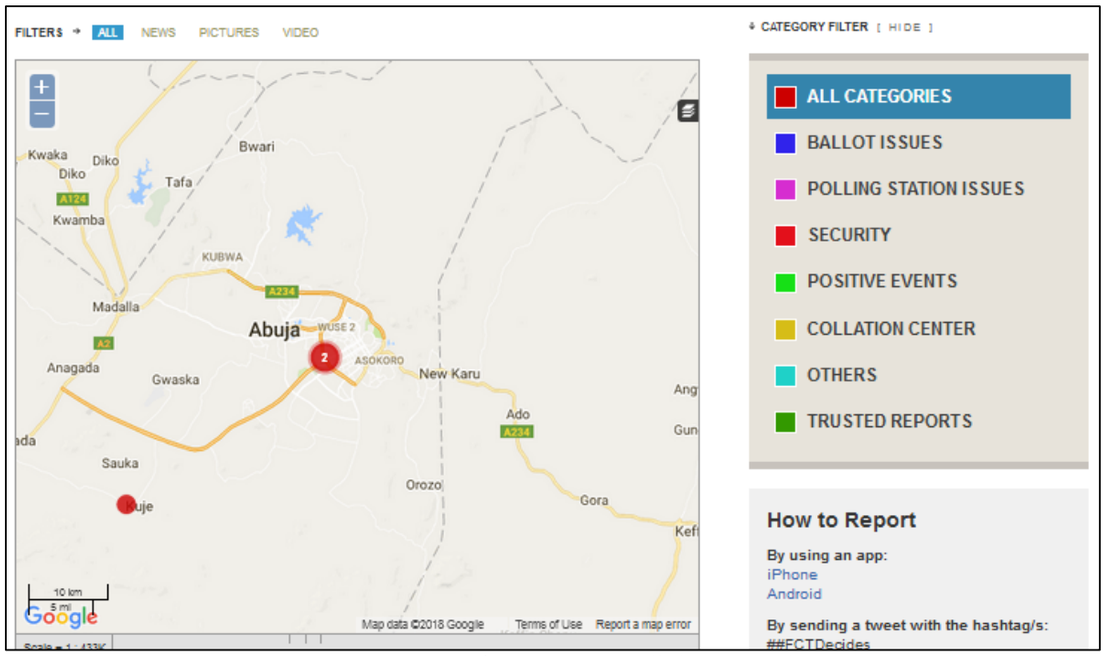

Figure 6: The Uzabe webmap which was used for observing the 2016 Federal Capital Territory municipal elections (Source: Uzabe, 2018)

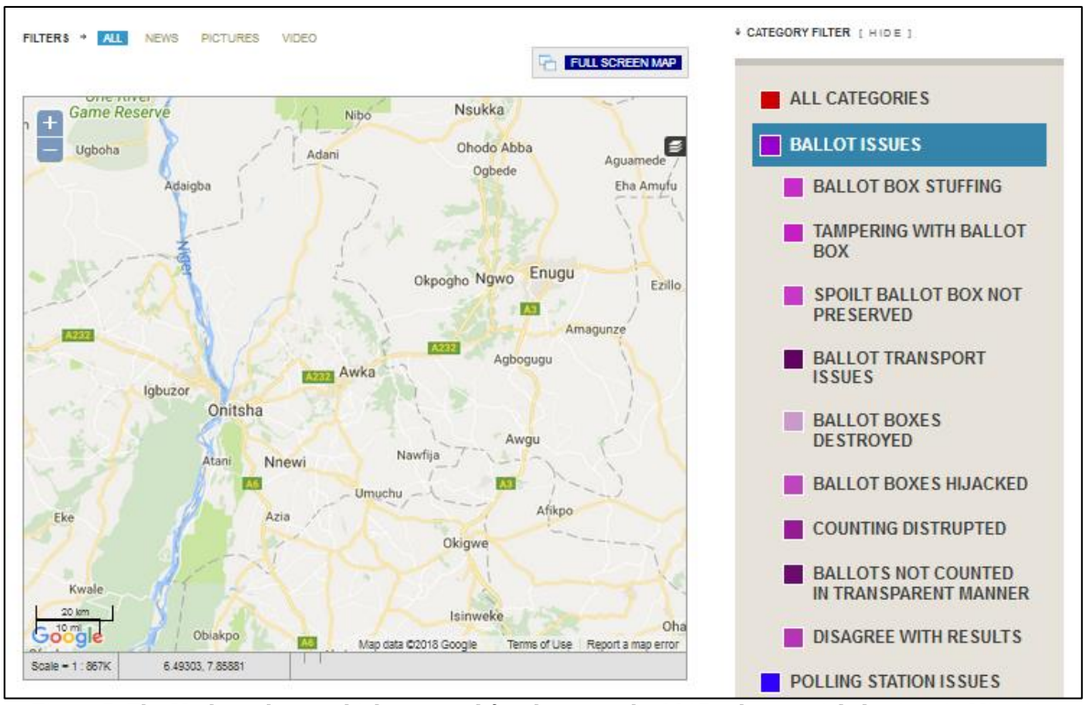

Figure 7: The Uzabe webmap which was used for observing the 2017 gubernatorial elections in Nigeria (Source: Uzabe, 2018)

CONCLUSION AND RECOMMENDATIONS

Nigeria's electoral system has a long history of political violence, malpractices, and government interference. GIS is an exceptional tool for the management of elections at all stages and in engendering election transparency. The study shows that the Nigerian Federal Government through the Independent National Electoral Commission has made some modest progress in the adoption of GIS for electoral mapping. Also, the country has been slow in embracing technological advancements in electoral administration. The Independent National Electoral Commission has not been very proactive in leveraging GIS and Information Technology for ensuring hitch-free, free and fair elections in the country. The use of GIS and Information Technology in innovative ways throughout the election life cycle should be in the forefront of INEC's operations. GIS is the key in enforcing the transparency of this system. It is suggested that INEC goes beyond the traditional approach of utilising GIS to produce static maps and webmap interfaces with limited support for enhanced visualisation and intelligent analytics. INEC should exploit GIS for more in-depth analysis and novel decision-making tools to support the good management and transparency of the electoral process.

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ASSESSMENT OF THE TOURISM POTENTIALS OF GURARA WATERFALLS, NIGER STATE, NIGERIA

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Tourism has become one of the largest and fastest growing economic sectors in the world. In Nigeria it is centered largely on events, due to the country's ample amount of ethnic groups, but also includes rainforests, savannah, waterfalls, and other natural attractions. Gurara Waterfalls is one of these tourism sites located in Niger State, Nigeria and it has enormous potentials that can be harnessed for tourism development. This research carried out an assessment on the tourism potentials of Gurara Waterfalls, through identification and analysis of its features and surrounding environment. Interviews, site analysis checklist, observation and Questionnaires were used as primary sources of data collection, and Niger state ministry of lands and housing, internet, google earth technology and Niger state culture and tourism corporation were the sources of secondary data collection. Results shows that Land allocated by Niger State Government for the development of Gurara Waterfalls is 1,105 hectares. The Area is characterised with thick Forest, Animals, combination of undulating and flat topography. The Waterfall is at its peak during the months of June to October in rainy season when the water covers the whole cliff and off-peak period of the Fall is between the month of October and May in dry season. Down the Fall span about 200 metres and a depth of about 50 metres, there are no organised recreational, facilities and services or activity present at the Fall, and some management challenges such as unavailability of tourists' statistics. SWOT analysis conducted showed that the Location has numerous Strengths, Weaknesses that can be controlled and the Opportunities outweighs the threats making the site a viable location for development of tourism destination

Keywords: Economic,environment, housing tourism, waterfall

INTRODUCTION

Tourism is the totality of the phenomenon arising from the travel and stay of strangers, as long as the stay does not imply the establishment of a permanent residence for the Purpose of Leisure, Business and entertainment (Bhatia, 2002). Tourism is a very potent driver of economic growth and employment creation all over the world. The Sector of Tourism is accountable for 8.8 percent of the world's Jobs (258 million jobs); 9.1 percent of the World's GDP (US$6 trillion); 5.8 percent of the world's export (US$1.1 trillion); and 4.5 percent of the World's investment (US$652 billion) (Iain, *et al.*, 2013). In Nigeria, Tourism is centered mainly on events as a result of the Country's large number of various ethnic groups, however also include rainforests, waterfalls, savannah and various natural attractions, however, the industry suffers unfortunately due to the country's poor infrastructure such as; roads, electricity, and potable water (Maurice, 2004).

Gurara Waterfalls holds the potential to become a world-class Tourist destination by virtue of its pleasant weather, beautiful sceneries, and conducive vegetation; and can be conceivably developed to the standard of the Niagra Falls, and Victoria Falls. These have remained potentials and not harnessed. An access road, a hut and an observation spot are the only developments existing at the Falls over the years till present.

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Musa, et al (2018). **ASSESSMENT OF THE TOURISM POTENTIALS OF GURARA WATERFALLS, NIGER STATE, NIGERIA.** Contemporary Issues and Sustainable Practices in the Built Environment. School of Environmental Technology Conference, SETIC, 2018

Nigeria is a country in quest of economic diversification from Crude Oil to maximize employment and income generating opportunities. In view of the dwindling oil revenue and endemic uncertainty in the global oil market, it has become imperative for Nigeria to find other more sustainable sources of income. Developing Gurara waterwalls as a turist destination in Niger State will boost the economy of the State. To carry out development at the fall, it is of an utmost importance to carry out an assessment of the tourism potentials within the falls and its environ. This study therefore assessed the tourism potentials of Gurara Waterfalls so as to propose measures for its development.

The Study Area

Gurara Waterfalls is found in Gurara Local Government Area of Niger State with Its Headquarters Located at Gawu-Babangida. Gurara Local Government Area has 10 Wards which includes; Bonu, where Gurara Waterfalls is found, Diko, Gawu, Izom, Kabo, Kwaka, Lambata, Lefu, Shako and Tufa. It has a total Land area of about 1,126.3km^2 and an estimated Population of about 90,974 people in 2006 (Niger State Department of Budget & Planning, National Population Commission, 2015)

The Falls originated from River Gurara which is a large tributary of the famous River Niger. It is located in Gurara Local Government Area at Latitude 7^{o}E and Longitude 9^{o}N. This impressive waterfall, is located 2km off Minna-Suleja Road, about 68km from Minna by road and 35km from Suleja by road (see figure 1.1) (Niger State Culture and Tourism Corporation, 2015). The Niger State Government allocated a total of 1,105.759 hectares for the development of the Falls (Niger State Culture and Tourism Corporation, 2015).

The Falls is located in a tropical climate characterised by annual two distinct seasons; the wet or rainy season and dry season. The area has an annual rainfall of less than 1000mm, which occurs between April and September having a peak period between July and August. The dry season Occurs within a period of six months, between the months of October and March (see figure1.2).

The Temperature of the Study area differs within seasons. Through the dry season, temperature is relatively high because, the sun is in the southern hemisphere. High temperature of between 30OC and 40OC are recorded within December to April while the Wet season experiences lower temperature of between 26OC and 30OC highest within the season occurring at middays between May to July.

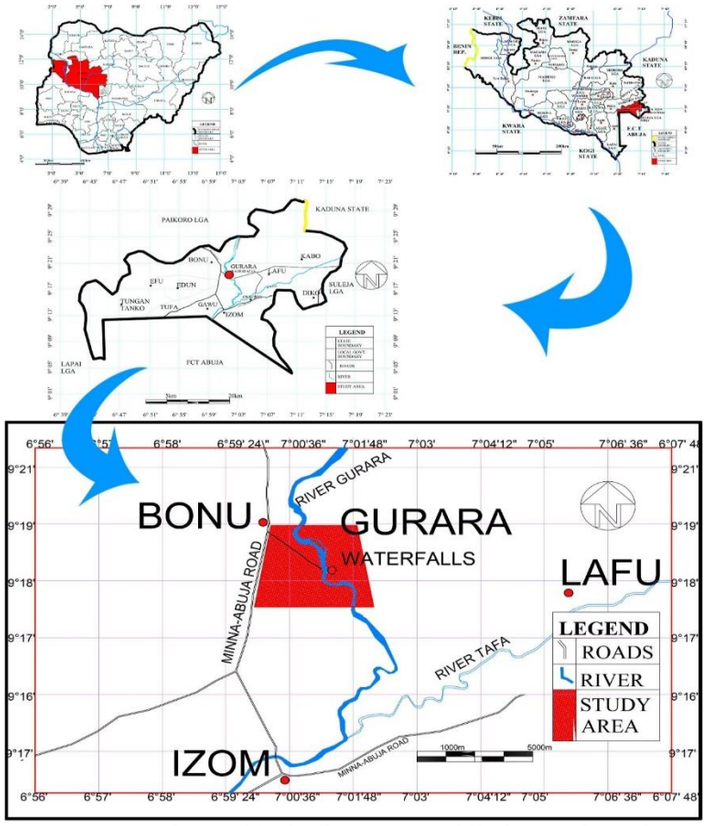

Figure1: Locational Map of Study of Gurara Waterfalls showing the Study Area
Source: Niger State Ministry of Lands and Housing (2015)

Conceptual Clarification

Tourism is a concept that has emerged with several definitions from various authorities in time past. The United Nations World Tourism Organisation (2007) defined Tourism as comprising the activities of a person or persons travelling to and staying in places outside their usual environment for not more than one consecutive year for either leisure, business and other purposes Bhatia (2002) defined tourism as the totality of the phenomenon arising from the travel and stay of strangers, as long as the stay does not imply the establishment of a permanent residence and is not connected with enumerated activity.

Ajayi and Lawal (2010) viewed tourism to be anything that possess the natural ability or potential capacity to stimulate people's interest and move people from place to place. This implies that any voluntary and temporally activity that takes a person away from his or her usual place so as to satisfy a need either for relaxation, excitement and pleasure experience can be called tourism. The The key elements worthy of note from the definitions of tourism are: travel, tourist, leisure, destination, temporary stay, voluntary activity and attracting ability. All these key elements therefore make up the entirety of Tourism as a concept whether locally or globally.

There are six different types of tourism from the country of reference perspective presented by Statistics South Africa (2009) which includes the following:

i. Domestic tourism: This consists the movement and activities of a visitor who's the economic region of the country of reference is owns residence. It is a kind of outbound trip or domestic trip;
ii. Inbound tourism: Include the activities of visitor's non-resident within the economic region of the country of reference;
iii. Outbound tourism: This include the activities of visitors out of the pecuniary area of the reference country, either basically as an outbound trip, or a domestic trip;
iv. Internal tourism: Internal tourism encompasses the activities of both resident and non-resident visitors within the economic region of the country of reference as part of domestic or international trips;
v. National tourism: This refers to the resident visitor's activities within and outside the pecuniary region of the reference country, either as part of outbound trips or domestic; and
vi. International tourism: denotes the resident visitor's activities outside the economic territory of the country of reference, either as outbound trips or domestic trips, and the activities of non-resident visitors within the pecuniary region of the country of reference on inbound trips.

Tourism in Nigeria

Nigeria has abundant attractions, climatic and geographical diversity, including; the Atlantic Ocean in the south the confluence at the Middle Belt region to the far North Sahara. One can travel within few hours, from the Sahel to Sudan to snowing mountains in the North - East and Jos Plateau also to luxuriant forests in Calabar, Tinapa Resorts and Obudu mountain resort to areas of exclusive cultivation in warm waters of the coast (Ajadi, 2012). Nigeria has diverse potentials for ecotourism and marine tourism in attractive shores due the Country's geographical location and condition. Nigeria Tourism Development Corporation (NTDC) is the apex tourism agency of the Federal Government of Nigeria charged with the general responsibility of marketing, promoting, and coordinating Nigerian tourism activities. The Nigerian succeeding governments took some policies influenced by social, political and economic forces that formed and developed the tourism activities. However, the Government has been the sole managers, promoters and sponsors of tourism in Nigeria until recently. (Ajadi, 2012).

The challenges of tourism in Nigeria includes the following:

i Superstitious belief: Onwuejeogwu, (1992) asserted that Nigerians see a piece of African art as a bronze object or a piece of juju wood which Europeans only admire out of curiosity. African dances or dramas are inaccurately perceived as nothing better than forms of incoherent or incongruous display of paganism and African traditional music are seen as a discord of barbarous pagan noise. The local communities in most cases are often regarded as unimportant in related matters as to tourism planning thereby neglected, which contributes to poor attitude and poor perception of the communities towards tourism (Enemou, Anozie and Otta, 2012).

ii Inadequate Statistics: There is a lack of reliable Tourism statistics and Market in formation in Nigeria. The 2006 report of The United Nations show that the figures of revenue from domestic tourism travel in Nigeria is not known, but the substantial amount of the population of Nigeria places an increasing demand on tourism services (UNWTO, 2006).

iii Security Issues: Another depressing Challenge in the Nigeria tourism industry is the security unrest and issues, although there is a reduction in militancy in the Niger Delta owing to the amnesty declaration by the Nigerian Federal Government since 2009, the recent insurgency by Boko Haram in the North and North-Central parts of Nigeria Leading to the bombing of central areas, United Nations headquaters and Police headquarters within Abuja, and many other calculated attacks launched at places of worship, military formations and public offices has become a serious concern for potential tourists (Enemou, Anozie and Otta, 2012).

i. Challenge of Neglect: Majority of the elites in Nigerian spend summer holidays in Europe and America, having holidays at parks, gardens, squares, and even museums. They lack interest in visiting the nearby village or a traditional play staged in the neighbourhood in their home country (Nigeria) (Onwuejeogwu, 1992). Although there exist numerous tourism potentials in Nigeria, many of these attractions are still lying fallow and even at their undeveloped states, they are still being enjoyed by few foreigners, such as wealthy visitors looking for exoticism or adventurous people, also in search of new experiences and challenges (Bisina and John, 2013).

RESEARCH METHODOLOGY

Data were collected from Primary and Secondary Sources. The primary Data collected are through direct field survey while the secondary data were collected from published materials relevant to this research. Interview was conducted with the Staff of Niger State Culture and Tourism Board which include the General Manager of the Corporation, two clerical officers, the Site Manager of Gurara Waterfalls and the gate keeper of Gurara Waterfalls. Site analysis checklist was used to derive the site analysis report which include; Site analysis and inventory of facilities and attractions, on-site and off-site infrastructures within and around the study area. Direct field observation was also conducted to obtain data on the physical characteristics of the fall and facilities existing and the potentials the Fall holds. A total of 200 Questionnaires were administered to the visitors the fall in April 2015 to ascertain the tourism characteristics of visitors and complementary facilities that can give maximum satisfaction and attract more tourists both locally and internationally. The Questionnaires were administered on daily basis to the visiting Tourists who were willing to respond. Data were presented and analysed using descriptive statistical method through the use of tables, graphs and simple charts e.g. bar charts and pie charts, picture plate presentations and map presentation.

RESULTS AND DISCUSSION

It was observed that Gurara waterfalls is an example of Block/Sheet Ledge Waterfall as Water descends from a relatively wide river at a height maintaining partial contact with the bedrock. Result indicated that the Waterfalls is at its peak during the months of June to October in the rainy season. At this period, the water covers the whole cliff and tumbles down the rock to the bed bellow forming a massive water flow (Plate I). The off-peak period of the Falls is between the month of October and May in the dry season when the water flow reduces and the falls are at points from the cliff which flows gently downstream (Plate II).

Plate I: Gurara Waterfalls during peak period in August
Source: Field Survey (2015).

Plate II: Gurara Waterfalls during off-peak period in April
Source: Field Survey (2015).

Results shows that the vegetation of study area is characterized by thick forest including broad trees, shrubs, and grasses of several species which serves as good green space that supports biodiversity and ensures neutrality of the environment without distortion. The management also reported that there are animals existing within the study such as monkeys, pythons, birds, antelopes, and other wild animals. The River itself is rich with different species of Fishes.

Infrastructural facilities present at the study area includes; Paved Road of 14 metres width that creates accessibility to the Falls, a shed for food and soft drinks services and a non-functional 33KVA Transformer for providing electricity to the Falls. There is no organized water supply infrastructural facility within the Falls as observed and from the interviews. People tend to create the kind of activity that best satisfy them such as swimming and picnicking. However, there is an animal cage intended to be used for a mini zoo which is empty at present, 2 concrete sit outs for relaxation and 2 seesaw swings bar without the swings as observed.

Table 1: Statistics of Tourists Traffic for the Months of March and April in Gurara Falls

MONTH	Frequency	Percentage (%)
March	537	56.7
April	410	43.3
Total	**947**	**100.0**

Statistics from the Niger State Culture and Tourism Board shows that the tourists who visited Gurara Waterfalls in March 2015 is 537 Tourists and in April 2015 is 410 Tourists.

Table 2: Age distribution of Tourists

Age (years)	Frequency	Percentage (%)
less than 18	35	17.5
18-30	97	48.5
30-45	58	29.0
45-60	5	2.5
above 60	5	2.5
Total	**200**	**100.0**

Field survey shows that the majority of Tourists (48.5%) that visited Gurara Waterfalls within this period of research are within the ages of 18 and 30 while the elderly has the lowest percentage (2.5%).

Table 3: Distribution of Respondents according to Employment Status

Employment	Frequency	Percentage (%)
Civil servants	16	8.0
Private	20	10.0
Self employed	12	6.0
Unemployed	40	20.0
Student	112	56.0
Total	**200**	**100.0**

Source: Field Survey (2015).

Students are having the highest percentage of Gurara falls patronage as shown in table 3. They usually visit in groups from secondary schools and universities as part of school excursion or group parties and picnics. The self-employed (6.0%) and Civil servants (8.0%) have the lowest percentage, and one of the respondents explained that is as a result of busy work schedule and the only opportunity in the public service is annual leave. He further explained that the existence of the Falls alone cannot attract people of busy schedules and therefore suggest provision of attractions such as recreational facilities and amusement parks for children.

Table 4: Factor that determine Tourism visit to Gurara Waterfalls

Determinant	Frequency	Percentage (%)
Increased income level	20	10.0
Tourism destination availability	155	77.5
Easy Access to the Fall	25	12.5
Total	**200**	**100.0**

Source: Field Survey (2015).

Result shows that of the tourists (77.5%) visits Gurara Waterfalls because of its mere existence, but stated that they will visit more often if it is fully equipped with facilities and services that gives them maximum satisfaction of tourism experience. This portrays that the tourism potential alone cannot attract tourists compared to when its accessibility, facilities, attractions and services are fully developed to accommodate tourists' behavior.

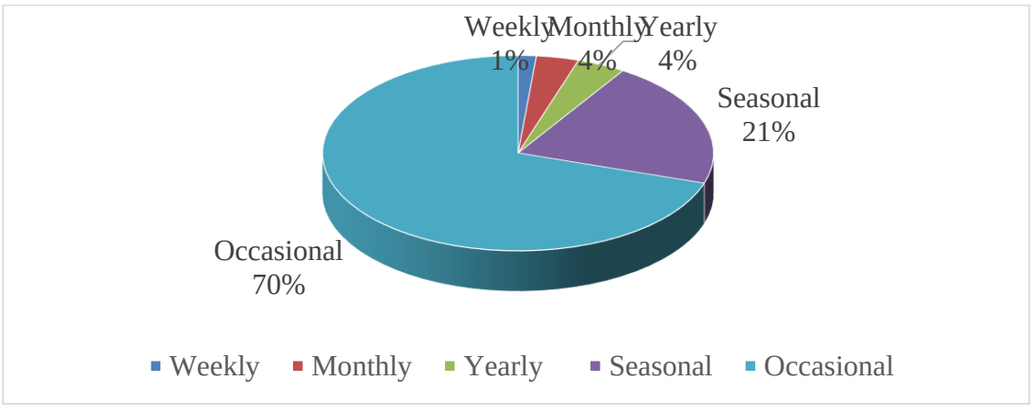

Figure 4.6: Respondents Frequency of visit
Source: Field Survey (2015)

About 70% of tourists visits Gurara Waterfalls sporadically which is however as a result of its underdevelopment without any motivation and attractions that has pool effect apart from a special event or occasion that requires their presence. However, about 21% of tourists visit the Falls seasonally especially during the festive seasons and some people visit at least once in a year to notice developmental changes and for recreation.

Table 5 shows that 91% which is majority of respondents stays at the fall less than a day this is because there are no much recreational activities to carry out apart from passive sightseeing and swimming or those who are able to do so. About 0.5 % stays for more than a day but less than a week, those are the respondents that came for other activities apart from visiting Gurara Waterfalls.

Table 5: Tourists Duration of stay

Duration	Frequency	Percentage (%)
less than a day	182	91.0
a day	7	3.5
more than a day but less than a week	1	0.5
Total	200	100

Source: Field Survey (2015).

Management of Gurara Waterfalls

Gurara Waterfalls is under the management of Niger State Culture and Tourism Corporation However the inhabitants of Bonu Village are the Custodians of the Fall and also serve as security to the Falls. Means of revenue generation from the Falls is the entrance fee of ₦500 (US$2.5) paid by visitors before they are allowed to go in. From the tourists' statistics of March and April which is 537 and 410 respectively, the average income Gurara Waterfalls generates at present per head in a month is ₦240,000.00 (US$1,212).

Management Challenges in Gurara Waterfalls include the following:

i. Lack of required Manpower

There is shortage of qualified and relevant staff strength that are directly concerned to the Falls. What the Niger State Culture and Tourism Corporation have is mostly hospitality personnel In terms of hotel management organization and cultural activities within the state. They believe what they have and manages at present are just tourism potentials as such needed more of promotion to attract investment. Employment of high skilled manpower is therefore of lesser priority since revenue generated might not self-sustain the falls management.

ii. Inefficiency in Management

The Niger State Ministry of Culture and Tourism who is in charge of management of Gurara waterfalls could not provide a precise statistics of tourism visits and incidence of death cases over the years and attributed the inability to lack of requisite personnel present at the Location.

i. Death cases

At the entrance within the Fall there is a sign post that prohibits swimming within the Falls and disclaimer for the security of people who swim. From the interview results, some tourists have drowned as a result of negligence of tourists with 2 records of such cases in 2014.

Table 6: SWOT Analysis of Gurara Waterfalls

STRENGTHS	WEAKNESSES
• Attractive Features of the Fall • Conducive vegetation around the Fall • Proximity of the Fall to the Federal Capital Territory (FCT) • Potential of becoming the "Cash Cow" of Niger State	• inefficient management • Inadequate Solid Waste Management • Absence of recreational facilities and attractions • Underdeveloped Infrastructure
OPPORTUNITIES	**THREATS**
• Revitalization of Local culture and cultural activities • New Research into Travel Trends That Favor Destinations in Niger State • New Markets Emerging Around • The Falls • Increase Destination Marketing • Growth of Ecotourism Market • Attraction of investments • Increase in Niger State's Internally Generated Revenue (IGR)	• Political Instability • Security issues as a result of Insurgency within the country • Ongoing Environmental Degradation • Weak Naira Exchange rate

Source: Field Survey (2015).

The SWOT analysis as shown in Table 6, portray the internal influences of Gurara waterfalls as a tourist destination which includes; its strength and its weaknesses that either supports its development or militates against its development these however are within the confides of internal control measures. It also includes; opportunities which are positive impacts of the Falls development and Threats which could militate against the growth of such positive impacts that may be derived. These are however external influences outside the confides of

Destination control measures. From the SWOT analysis, the Strength and Opportunities far outweigh the Weakness and Threat. This makes the project of developing Gurara Waterfalls a viable one.

CONCLUSION AND RECOMMENDATIONS

From the research conducted, Niger State can become a hub of international tourism with its abundant natural land features, historical monuments, historical relics and Cultural attractions. However, mere potentials cannot turn the State's economic position around. Gurara Waterfalls can be called Niger State's potential tourism economy which has been left untapped over the years adjudicating from the Fall's lack of infrastructures such as circulation, water and functioning power supply, absence of other facilities and services for more Tourists' attraction and Tourism activities, absence of accommodation facilities and inefficient management.

The following are therefore planning recommendations which would be most appropriate towards achieving the development Gurara Waterfalls.

i The need for adequate infrastructural facilities and utilities such as transportation and communication facilities like telephone services, internet services, electricity and water supply is vital and an important ingredient in any tourism market. Therefore, the provision of such infrastructures is very vital in this plan.

i. Any tourist destination that is not properly linked with the outside world would have less than expected patronage. It is therefore important to improve upon the Minna-Suleja Road that links Gurara waterfalls to other parts of Nigeria to ensure easy access and encourage visit.

I. In development, Resort facilities should be sited in such a way that there will be integration between natural and manmade facilities within the site creating a balance and continuity which are the major criteria for a sustainable tourism.

II. There is need to motivate the field staff and encourage them to understand the need to explore innovative ways of generating revenue, discouraging corrupt practices such as embezzlement which is supported by current economic trend.

III. Actions such as uncontrolled fishing, bush burning, hunting of animals and refuse dumping in the river should be highly prohibited and enforced.

IV. The ongoing campaign about urban governance is a right direction to follow in emphasizing the importance of private sector participation in tourism services delivery to the interest group of the society. The habitat agenda adopted by the world's Governance in Istanbul (1996) affirmed that policies and programmes for the development of human settlements require strong, open and accountable local Government institution working in partnership with all interested private sectors.

V. Tourism policy is very vital in development of tourism activities in Nigeria. It happens that few States in Nigeria has a genuine tourism policy such as Nassarawa State. It is important to establish a policy which provides guideline in tourism Development in the state which must be reviewed and strengthened from time to time. This policy should incorporate all recommendations made in this project.

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PERFORMANCE EVALUATION OF OUTSOURCED FACILITY MANAGEMENT SERVICES AT BAZE UNIVERSITY ABUJA

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The study aims to examine the impact of outsourcing on facility management services delivery at Baze University, Abuja. Data collection was through self-administered questionnaires sent to Maintenance and Facility Management staff as well as on-campus users of outsourced Facility Management Services in the institution. The results of the questionnaire survey will be supplemented with interview. The study revealed that respondents were dissatisfied with the performance level of outsourced Facility Management services in the institution. The paper recommends the need for implementation of service Level Agreement (SLA), stating clearly the roles and expectations of the client and outsourced vendor to enable assessment and evaluation thereby enhancing performance and consequently improving users' satisfaction.

Keywords: Outsourcing, facilities management, facilities management services, Service Level Agreement.

INTRODUCTION

The procurement of goods and services is a key function within facilities management (FM), ensuring that goods and services are provided competitively and that they add value to the organisation's core business (Facility Management Handbook, 2009). In this respect, the choice, planning and implementation of procurement activities are a central tenet of efficient management. Any procurement activity must be based around a sound understanding of the overriding strategic considerations (Facility Management Handbook, 2009).

Outsourcing is the process of establishing and managing a contractual relationship with an external supplier for the provision of capacity that has previously been provided in-house (Momme and Hvolby, 2001). Outsourcing occurs when an organisation transfers some of its tasks to an outside supplier or provider which is not a direct part of the organisation (Gnuschke, Wallace, Wilson and Smith 2004). Kremic, Tukel, & Rom (2006) perceives outsourcing as a common practice among both private and public organisations and a major element of the business strategy. The process of outsourcing can be looked upon as a strategic move among businesses, to reduce the overall cost of maintaining or increasing product quality (Gnuschke *et al*. 2004).

Over the years, facilities management has grown from what was traditionally perceived to be mere managing of buildings or maintenance unit of an organization to the holistic reality of being woven into the core and support services of organizations, particularly in public sector organisations (Price, Pitt, & Tucker 2011; Ikediashi, Ogunlana, & Awodele, 2012). In the view of Nutt (2004), facilities management is an integrated approach to management of building / infrastructure (product) and services of an organization in order to create an environment that supports the primary objectives of that organization.

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Bajere & Akor (2018). **PERFORMANCE EVALUATION OF OUTSOURCED FACILITY MANAGEMENT SERVICES AT BAZE UNIVERSITY ABUJA.** Contemporary Issues and Sustainable Practices in the Built Environment. School of Environmental Technology Conference, SETIC, 2018

Pitt and Tucker (2008) described facilities management as the integration and alignment of the non-core services, including those relating to premises, required to operate and maintain

a business to fully support the core objectives of the organisation. According to Chitopanich (2004), the primary function of Facility Management (FM) is to handle and manage support services for meeting the needs of an organization, its core operations and employees.

Higher Educational Institutions (HEIs) is very vital for the transformation of the nation's human resources into competent and productive agents of development in all sectors of the economy. Firstly application of appropriate management techniques would assist in taking care of all available facilities. In other words, facilities which might have suffered neglect as a result of carelessness, ignorance, lack of commitment and lack of resources for maintenance, would require commensurate attention from facilities managers. Also, school facilities which are well managed are likely to be durable. This research will therefore posit the suggestion that HEIs place importance on cost factors when deciding to outsource facilities management services in order to free up funds for development.

There has been accumulating evidence of failure of organizations to meet key objectives of efficiency, equity and responsiveness to users and communities (Birdsall and James, 1992; Mills 1995). Decay of infrastructure, inadequate funding, increasing enrolment, poor rating of HEIs in procurement of FM services in Nigerian Public sector are some of the problems identified from related literature. Despite the efforts of several researchers (Opaluwah 2005, Mbamali and Adebayo 2006, Ikediashi, 2014, Aishah, 2007 and Ojo 2002), the impact of outsourcing on FM services is clearly unknown.

The study aimed at evaluating the impact of outsourcing of facility management (FM) services delivery at Baze University, Abuja. The specific objectives were to: Determine which type of services should be outsourced in Higher Educational Institutions, determine factors that influence the decision to outsource facilities management services in Higher Educational Institutions and evaluate outsourced services at the selected institutions to determine service quality.

LITERATURE REVIEW

Concept of Facility Management

The cosmic evolution of facility management industry has given credence to the organization’s capability of adding world class value to its business operations in order to achieve the best business outcomes in terms of agility, flexibility, business continuity, corporate strategic objectives and most importantly competitive advantage (Aishah, 2007). Ideally, FM offers an integrated approach to maintaining, improving and adapting the buildings and other infrastructure of an organization in order to create an environment that strongly supports the primary objectives of the organization (Strategic Facilities Management Section (SFMS), 2006; Barret and Baldry, 2003). The international Facilities Management Association IFMA, 2006) describes FM as a profession that encompasses multiple disciplines to ensure functionality of the built environment by integrating, place, process and technology. The breadth of the FM activities covers: cleaning, heating, ventilation, air-conditioning, electrical, building and plumbing trades, grounds or landscaping, concierge, call Centre, tenant liaison, car parking, energy management, waste management, sustainability management, mail-room and pest control (Collings, 2007). FM can be outlined as creating an environment that is conducive to carrying out the organization’s primary operations, taking an integrated view of the services infrastructure, and using this to deliver customer satisfaction and best value though support and enhancement of the core business (Atkin and Brooks, 2005).

Facility Management Approaches

The rising popularity of facilities management coupled with the growing interest of the public sector in the outsourcing of FM services underscores the need for organisations to make careful decision about whether to outsource or use in-house staff. According to Ancarani and Capaldo (2005) there are several strategies available for Facilities Management: In-house involving provision of service by a dedicated employee in the organisation, outsourcing in which service is commissioned from an external supply organisation usually under the terms of a formal contractual arrangement based upon terms and conditions derived from a service level agreement, public private partnership (PPP) which involves formation of partnership or strategic alliance between the organisation and service provider based on a sharing of responsibilities; and total facilities management

(TFM) in which a whole range of services are bundled together and externalized to a single supplier which becomes totally responsible for the delivery, monitoring, control and attainment of stated performance objectives in the contract. However the choice of which of the four approaches to adopt will depend on a number of factors such as cost considerations, flexibility and transfer of risks. The best approach should be the one that provides value for money to the client organisation and its customers. Many organizations are vigorously adopting outsourcing as a way of improving sustainable resource management practice while most of them have functional facilities management units (Ikediashi, 2014).

Outsourcing in Facility Management Services

Outsourcing has been defined by various scholars as the "contracting-out" of services that were previously performed in-house to an external service provider as a mean of increasing organisational efficiency and effectiveness (Steane and Walker, 2000; Monczeka *et al*., 2005). Several definitions have been presented by scholars like Lacity and Willcocks (1998), Kern and Willcocks (2002), Aubert (2004) are all unanimous in their definitions of outsourcing as "the process whereby an organisation "contracts" out all or part of its components (assets, people and/or activities) to a third party usually an external provider who in exchange provides and manages the activities for an agreed fee over a period of time. Thus, outsourcing involves the contract between an organisation and an external provider for the purpose of contracting out services which were previously performed by in-house staff. There is a school of thought which argues that outsourcing is just the procurement of services or products in order to cut costs (Domberger, 1994). The idea here is that the services do not necessarily need to have been previously performed in-house.

Factors Influencing Outsourcing of FM Services

Facilities management is a very wide field and consequently a continually changing one (Barret, 1995). Atkin and brooks (2005) emphasize that extensive facilities management functions may be successfully performed or provided either by in-house or out-sourcing approach, depending on the priority placed on the activities or services by an organization.

Outsourcing decision can be subjective or objective (Atkin and Brooks, 2005). It is subjective when decision to outsource is influenced by the opinion of the organisation, it is objective when decision to outsource is unbiased and based on past experience. Harkins (1996) opines that vision, function and economics derive the need for outsourcing. Apparently, outsourcing decision is enormously derived from the fact that it is able to support functions that can be completed faster where better quality can be guaranteed at cheaper and reasonable cost. McCarthy (1996) recognizes four primary reasons why a firm may consider outsourcing, namely: outsourcing allows companies to refocus their resources on their core business; outsourcing let companies re-examine their plans, make them more efficient and saves time and money while improving efficiencies; companies outsource to improve service level or helps to reduce cost over a long term.

Behara *et al*. (1995) emphasize the factors that need to be considered in outsourcing decision in the context of a specific situation as follows:- impact on company competitiveness, identifying to be outsource, the numbers of suppliers to be used, ability to return to in-house operation if required, supplier reliability and service quality, coordinating with the supplier and evaluating performance, flexibility in products offered by the supplier and proving the latest or advanced technology and expertise. The outsourcing institute (2005) adds to the lists of significant reasons companies choose to outsource: improve focus, reduce costs, gain access to world class capability, free up resources, resources not available internally, reduce time to market, advantage of offshore capabilities, and accelerate engineering benefits, share risks and functions difficult to manage

Advantages of Outsourcing

Outsourcing creates competitive advantage when products or services are produced more effectively and efficiently by outside suppliers. This lends credence to the observations of Gilley and Rasheed (2000), that organizations are increasingly turning to outsourcing in an attempt to enhance their competitiveness. The authors argue that firms that outsource may achieve long-run advantages compared to firms relying entirely on internal production. The decision to outsource enables organizations to achieve costs reduction, expand services and expertise, improves employee productivity and morale, as well as achieve greater potential towards sharpening corporate image (Fill and Visser, 2000).

Furthermore, Gilley and Rashed (2000) observe that firms focusing on outsourcing can switch suppliers as new, more cost effective technologies become available. Indeed, outsourcing has helped companies ameliorate competitive pressure that squeeze profit margins and eliminate investment in fixed infrastructure, which allowed for improved quality and efficiency: increase access to functional expertise; and offered potential for creating strategic business alliances and fewer internal administrative problems (Fill and Visser, 2000).

Disadvantages of Outsourcing

Bettis *et.al.* (1992) and Kotabe 1992) postulated that reliance on outside suppliers is likely to lead to a loss of overall market performance. One of the most serious threats resulting from a reliance on outsourcing is declining innovation by the outsourcer (Gilley and Rasheed, 2000). From the business perspective, outsourcing vendors may gain knowledge of the product being manufactured and in fact use the knowledge to begin marketing the product of their own (Prahalad & Hamel, 1990). Problems experienced with outsourcing include: outsourcing vendor unable to deal with volume of activities; variance in work ethic between organization and outsourcing vendor; outsourcing vendor unable to perform task in specified time and fail to produce contractual results; inadequate contract performance and penalties; lack of capability to deal with time management when associating with outsourcing vendor; lack of flexibility; and contract solely focuses on cost cutting issues (Collings, 2007). Several other risks have been concomitant with outsourcing as summarized by Barret and Baldry (2003)

Service Quality Indicators for FM Services

Quality has variously been described as elusive, complex, and indistinct construct largely because it has often been mistaken for imprecise objectives like goodness, luxury or shininess, or weight (Parasuraman, Zeithaml and Berry, 1985). This is further complicated when looking at quality from services and product/goods perspectives. It is therefore not surprising that many researchers (Takeuchi and Quelch, 1983; Parasuramen *et al*., 1985; Cronin and Taylor, 1992) and practitioners alike found it difficult to agree on a clear definition and ways of measuring quality.

Performance and Service Quality (SERVQUAL)

The concept of organisational performance or profitability depends on meeting the five generic performance criteria of efficiency, effectiveness, productivity, flexibility, and creativity (Van-Ree, 2009). Effectiveness is defined as the ratio of actual and expected output and involves doing the right things, at the right time, and within the right quality (Sink and Tuttle, 1989). Efficiency on the other hand, is used to describe an input and transformation process equation as "the ratio of resources to be consumed to resources actually consumed (Sink and Tuttle, 1989). Productivity became more and more popular in the 1970s when costumers and consumers of goods and services became more and more aware of the value of a product or service as well as its quality and other aspects (Van-Ree, 2009). It was therefore defined as the ratio of actual output to expected resources (Sink and Tuttle, 1989); the ratio of what is produced to what is required to produce it (Hill, 1993); the ratio of actual result of transformation process to actual resource use which invariably relates effectiveness to efficiency (Van-Ree, 2009). Flexibility within the context of performance criteria refers to the ability of an organisation to respond quickly and adequately to unexpected changes and challenges. In that circumstance, an organisation should have met the criterion if it is able to recognise opportunities, threats, and weaknesses, and respond quickly and adequately in a way that will suggests it was successfully done. Creativity refers to the ability to manage the tension between effectiveness and efficiency as well as guarantee flexibility in such a way as to manoeuvre the influence of demographical, political, technological, social and ecological changes that may affect the environment in which an organisation operates.

User Satisfaction and Service Quality

In developing the SERVQUAL model, Parasuraman *et al*., (1988) argued that service quality as perceived by customers stems from a comparison of what they feel service providers should offer (expectations) with their perception of the performance of the service provider providing the services. In the opinion of Hui and Zheng (2010), SERVQUAL model measures service quality by comparing service expectations from customers with actual

performance of service providers. Therefore "the term expectation as used in the service quality literature differs from the way it is used in the customer satisfaction literature. Specifically, expectations are viewed as predictions made by customers about what is likely to happen during an impending transaction. In contrast, in the service quality literature, expectations are viewed as desires of customers i.e. what they feel a service provider should offer rather than would offer" (Parasuraman *et al*., 1988, p.17 cited in Van-Ree, 2009). The SERVQUAL model is an instrument based on five dimensions to characterise consumers' perception of service quality: tangibles, reliability, responsiveness, assurance and empathy. The model assesses areas of good or bad quality and can be used to show service quality trends over time and for benchmarking purposes (Van-Ree, 2009).

Management of Tertiary Educational Facilities

Educational facilities refer to non-human and non-financial resources. The also include all movable and immovable items, which are used for teaching, learning and other related activities. They are synonymous with schoo1 physical facilities, school material resources, school plant etc. Olagboye (2004) stated that educational facilities consist of instructional resources such as audio – visual aids, graphics and printed materials and consumable materials. They also include physical resources such as land, building, furniture, equipment, machinery, vehicles, electricity and water supply infrastructure. In another dimension Ojedele (2004) identified three components of educational facilities such as school infrastructure, such as buildings and playgrounds; instructional Facilities (teaching-learning materials, equipment and furniture) and school physical environment (beautification of the school environment).Thus, here are different kinds of facilities that could be used for teaching and learning purposes. The facilities are located within and outside school premises.

Facilities tend to depreciate as soon as they are provided-and put into use. Therefore, there is need for management and maintenance through repair and servicing of components in order to restore their physical condition and sustain their working capacity. Maintenance enhances performance and durability and prevents wastages. There are preventive, corrective, breakdown and shutdown maintenance services (Adeboyeje, 2000). Preventive maintenance occurs regularly by checking and rechecking the available facilities and taking necessary measures to prevent mal functioning or non-functioning. Prevention is not only better: but also cheaper than any other measures, especially if it is proactive. Corrective maintenance involves reactivation or replacement of facilities in order to normalize their performances. When a facility or equipment breaks down completely, a major repair or replacement may be needed. There may be a time when an institution may need to close down in order to allow a major repair to be carried out. Flood, fire or wind disaster may warrant closure of an institution for a major repair to be effected.

RESEARCH METHODS

Research Design

The cross-sectional survey (survey research design) was adopted for this study because of its uniqueness, standardization of measurement and survey data can easily be used to complement existing data from secondary sources. The study will focused on non-core services outsourced in the Institution. The target respondents are the directors of units and divisions responsible for support services provision and students residing on campus in the institution. Purposive sampling which is a non-probability sampling method was adopted to enable samples that satisfy the predetermined criteria to be selected.

Self-administered questionnaire and field survey were used for data collection for the study. The quantitative data was analysed through descriptive statistics using measure of central tendency and dispersion. Qualitative data was obtained through interview. The qualitative data was analysed using Content Analysis. Creswell (2009) asserts that qualitative data analysis involves preparing data for analysis, conducting different analyses, moving deeper and deeper into understanding the data, representing the data and making an interpretation of the larger meaning of the data.

PRESENTATION AND DISCUSSION OF RESULTS

Outsourcing Decision Factors

Table 4.2 shows the year of residence of the respondents where 48% of the respondents have spent 3 years on campus, 32% of the respondents have spent 4 years on campus and 20% of the respondents have spent five years on the campus. The duration of stay of these students on campus is reasonable enough because it made them to be conversant with the service been rendered on campus.

Table 4.1 Result of interviewees' rating of outsourcing decision factors

Factors	Interviewee 1	Interviewee 2	Interviewee 3	Interviewee 4	Average	Rank
CSR	4	3	2	3	3.0	4th
Poor Funding	3	4	4	5	4.0	3rd
Lack of Expertise	5	5	5	4	4.8	1st
Inadequate Resources	-	4	5	3	3	4th
Time Factor	5	4	5	4	4.5	2nd

Table 4.1 Users' satisfaction with outsourced FM services in the University respondent's gender

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Male	20	80.0	80.0	80.0
	Female	5	20.0	20.0	100.0
	Total	25	100.0	100.0	

Table 4.1 shows the gender of respondents to the questionnaire administered at Baze University, Abuja. Where 80% of the respondents are male and the other 20% are female.

Table 4.2 Years of residence of respondents on campus

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	3 years	12	48.0	48.0	48.0
	4 years	8	32.0	32.0	80.0
	5 years	5	20.0	20.0	100.0
	Total	25	100.0	100.0	

Table 4.3 shows the users' satisfactory with quality of outsourced asset management services in Baze University, Abuja.. The respondents accepted that services that are "Reliable, dependable and accurate service" is the best way to manage Assets facilities in the campus. "Tangible, appearance of properties is ranked second in the asset management service

Table 4.3 Asset Management Services

S/N		MEAN	STANDARD DEVIATION	RANK	CLASSIFICATION
1.	Responsiveness (prompt service)	2.64	.49	5th	Moderate Effect
2.	Attitude and courtesy of personnel	2.84	1.07	4th	Moderate Effect
3.	Accessibility (being easily contacted and available)	3.08	1.08	3th	Moderate Effect
4.	Tangibles (appearance of properties	3.32	.63	2nd	Moderate Effect
5.	Reliability (dependable and accurate service)	3.84	1.37	1st	High Effect

Table 4.4 shows the ranking of the service quality of Maintenance services, where "Accessibility, (being available all times)" has the highest ranking and "competent, sufficient expertise" is ranked second. Availability of competent expertise makes the maintenance services easier.

Table 4.4 Maintenance Services

S/N		MEAN	STANDARD DEVIATION	RANK	CLASSIFICATION
1.	Attitude and courtesy of personnel	3.24	1.16	4th	Moderate Effect
2.	Awareness (knowledge of users' requirement)	3.28	.98	3rd	Moderate Effect
3.	Competence (Sufficient expertise)	3.64	.81	2nd	High Effect
4.	Accessibility (being available at all time)	4.20	1.35	1st	High Effect

Table 4.5 shows the level of satisfaction with cleaning services in Baze University, Abuja.. Responsiveness of personnel was rated first and "Reliability was rated second. The study observed that, though the personnel are responsive, they give little attention to the appearance of facilities. That led to empathy and appearance of properties coming fourth and fifth respectively.

Table 4.5 Cleaning services

S/N		MEAN	STANDARD DEVIATION	RANK	CLASSIFICATION
1.	Tangibles (appearance of properties	3.00	1.12	5TH	Moderate Effect
2.	Empathy (caring attention the vendor provides)	3.24	1.16	4TH	Moderate Effect
3.	Attitude and courtesy of personnel	3.64	.81	3RD	High Effect
4.	Reliability (dependable and accurate service)	3.84	1.37	2ND	High Effect
5.	Responsiveness (prompt service)	4.04	1.37	1ST	High Effect

Table 4.6 shows the level of satisfaction with security services in the institution where "Responsiveness, prompt service was rated first. Assurance, confidence instilling behaviour is rated second and Competence, sufficient capability is ranked third. Security personnel are responsive and have confidence instilling behaviour but respondents are not satisfied with the attitude and courtesy of personnel as well as their ethical conduct which came fourth and fifth respectively.

4.6 Security Services

S/N		MEAN	STANDARD DEVIATION	RANK	CLASSIFICATION
1.	Reputation (ethical conduct)	2.44	1.12	5th	Little Effect
2.	Attitude and courtesy of personnel	3.00	1.12	4th	Moderate Effect
3.	Competence (sufficient capability)	3.16	.94	3rd	Moderate Effect
4.	Assurance (confidence instilling behaviour)	3.24	1.17	2nd	Moderate Effect
5.	Responsiveness (prompt service)	4.04	1.37	1st	High Effect

CONCLUSION AND RECOMMENDATIONS

The study has revealed that the level of satisfaction with outsourced facilities management services in Baze University Abuja low. This dissatisfaction is greatly influenced by inability of outsourced vendors to meet users' expectation and there is no strategy put in place by the client to access the performance level of the vendors. The result of this study is in line with the result of Amole (2009a) which was carried out in Nigeria showing a level of dissatisfaction of the students with the hostel facilities. The study recommends that Service level agreement (SLA) should be implemented, stating clearly the roles and expectations of the client and the vendor to enable assessment and evaluation thereby enhancing performance.

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STRUCTURAL INTEGRITY OF HOLLOW SANDCRETE BLOCK WALLS IN FEDERAL UNIVERSITY OF TECHNOLOGY, MINNA USING REBOUND HAMMER TEST

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Hollow sandcrete blocks are widely used among other walling materials particularly in Federal University of Technology (FUT) Minna and Nigeria in general. The research investigated Structural Integrity of Hollow Sandcrete Block Walls in Federal University of Technology, Minna in terms of their characteristic strength and Rebound number. Laboratory and field tests were used in the investigation. A total of fifteen (15) block industries were randomly selected with four 450 x 225 x 225mm (9") blocks taken from each of the block industries. The characteristic strength of the randomly selected blocks produced commercially not considering the ages of production are between 0.15 – 0.77N/mm^2 for 450x225x225mm blocks as against Minimum characteristic strength of 1.5N/mm^2 recommended by the Nigerian Industrial standard (NIS: 587:2007). The rebound numbers of the sixty blocks from fifteen block industries are between 2 and 10 (less than the minimum of 20). Nineteen (19) existing completing buildings were selected for determination of the rebound number at Federal University of Technology Gidam Kwanu Minna. The rebound numbers are between7-21. Models were established for the commercial blocks and completed buildings to determine the compressive strength and rebound number. The model equations are Y= 0.077x-0.002 (Compressive strength and rebound number of commercial blocks) and Y=0.077x – 0.003 (Compressive strength from rebound number of completed building). The predicted compressive strength of all the buildings ranges from 0.77 to 1,46N/mm^2. The coefficient (R^2) of all the models ranges from o.94 to 0.99. These statistical values show high predictive capabilities of the models

Keywords: Hollow sandcrete block, Compressive Strength, Rebound number, walling material, Block Industry, model predicted value

INTRODUCTION

Hollow sandcrete blocks are made of a mixture of cement and sand with a varying percentage of water added to the mixture to be able to produce the specified standard mix ratio of 1:6 and 1:8 (NIS 587:2007). Some of sandcrete blocks are hollow and rectangular in shape. Hollow sandcrete block constitute over 90% of developed physical infrastructure (Anosike and Oyebade, 2012). Failure of building walls are mostly caused by poor quality of sandcrete block (Oyekan and Kamiyo, 2008)

Hollow sandcrete blocks produced by block industries in Nigeria, and Minna in particular are below standard Tsado *et al*., 2015. The mix proportion and mixing process are not carried out according to specification Tsado *et al*., 2015. The quality of blocks produced, however differs from one block industry to the other due to different method employed in the production and the properties of the constitute materials (Baidan and Tunlo, 2004)

Most block industries tend to maximise profit and minimised quality of blocks produced wuna, (2016). The increased rate of population growth and the demand for shelter to meet up with the population growth has given rise to increased number of block industries in Nigeria and Minna in particular.

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Sule, et al., (2018). **STRUCTURAL INTEGRITY OF HOLLOW SANDCRETE BLOCK WALLS IN FEDERAL UNIVERSITY OF TECHNOLOGY, MINNA USING REBOUND HAMMER TEST.** Contemporary Issues and Sustainable Practices in the Built Environment. School of Environmental Technology Conference, SETIC, 2018

The management of most of the block industries in Minna are in the hands of Directors and Managers who have little or no knowledge of the relevant professional ethics (Tsado *et al*., 2015). (Tsado and Yewa, 2013) stated that collapse of several buildings in Minna and the Talba Estate along Minna – Bida road in particular are partly attributed to among other things the use of poor quality blocks used in construction. Some block industries sells their products prematurely and construction companies and individuals that are eager to complete their project or own a house always buy them for their construction work. None of the block industries can produce evidence of any test of their products or material used for production Wuna, (2016). The situations have given rise to the production of substandard blocks which often results in sudden collapse of buildings (Tsado *et al*., 2015).

In Nigeria, house construction is one of the first priorities for most households and it represents the largest single investment for most (between 50 and 70 percent) of household income. The rapid growth of urban population over the years proceeded in an unrestrained and spontaneous manner. This gave rise to extensive slums and shanty settlements with construction activities without standards, resulting in poor structural quality.

The construction industry in Nigeria is founded on weak and unstructured policy. Windapo (2004) pointed out lack of support and structure necessary to facilitate the formulation and successful implementation of enduring policies for the industry. It was the weak foundation of the industry that supported the influx of both foreign and local operators to the point that even the non-professionals have now become contractors or manufacturers of construction projects in Nigeria. With the central role of shelter for comfort, safety and convenience of mankind, a lot of attention is being devoted on a daily basis in Nigeria, at providing composite materials for building houses. Notable among these is the production of hollow sandcrete blocks.

According to (Oyetola and Abdullahi, 2006; (Tsado *et al*., 2015) and Wuna, (2016), all the commercially produced hollow sandcrete blocks do not meet the required strength. These blocks are used as walling materials in most buildings resulting to collapses in some cases.. This work intends to investigate hollow sandcrete block wall with a view of determining their strength. In recent times cases of building collapses in Nigeria has been in the increase. In an attempt to gain insight into the problems, the study explores the question of the extent to which quality hollow sandcrete blocks are produced and tested. Some study (Oyetola and Abdullahi, 2006; Wuna, (2016) conducted have revealed that the commercial blocks produced in Minna are below Standard. However, the blocks have been used for construction purposes. The strength of the masonry units is still not known Aguwa, (2010). Some of these structures collapses as times goes on. The only techniques that may readily provide strength of existing structure is non-destructive test such as rebound hammer and Ultrasonic Pulse Velocity (UPV). In order to clarify these problems, the study was directed toward testing strength of the wall using commercially produced sandcrete block. This is to check if the required minimum strength of 1.5N/mm^2 (NIS587:2007) was satisfied.

METHODOLOGY

The Schmidt rebound hammer shown in Figure 2.1 weighs about 1.8 kg and is suitable for use both in laboratory and in the field. The rebound distance is measured on an arbitrary scale marked from 10 to100. The rebound distance is recorded as a "rebound number" corresponding to the position of the rider on the scale.

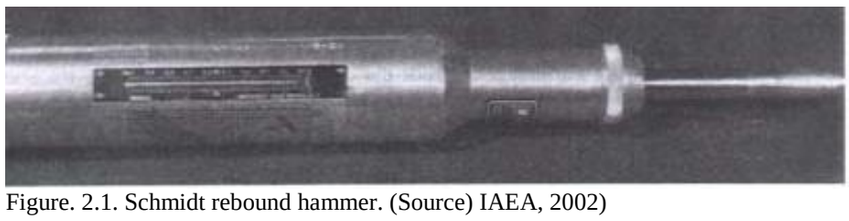

Figure. 2.1. Schmidt rebound hammer. (Source) IAEA, 2002)

In this research Schmidt Rebound Hammer was used.

Destructive test on commercial sandcrete block

The compressive strength test of sandcrete block was carried out on the selected blocks using manual crushing machine. Four block samples were selected randomly from the production in the selected block industries and tested. The average of the compressive strength from the selected sample was considered as the compressive strength of the block from the industry.

Size of hollow sandcrete block walls

The size of the hollow sandcrete blocks is 225 x 225 x 450mm (9") commonly used for load bearing walls in buildings construction in Nigeria.

Rebound number

On each sample of block, rebound number was determined on the four sides. The average from the four sides is taken as the rebound number of the sampled block. On walls, five (5) square meter of wall on four sides of selected buildings at Federal University of Technology, Gidan Kwanu (GK) Campus Minna were considered. Nnine (9) rebound readings on the surface of a square meter wall is recorded. Average of the readings was taking as the rebound number of the square wall. The rebound hammer operates with a minimum rebound number of 20 (IAEA,2002).

Description of selected block industries and buildings at FUT Minna

The description of selected commercial block industries within Minna and its environment and the selected building is are described in Table 2.1.1 and 2.2.

Table 2.1 Selected Commercial Block Industries Minna

S/N	Description	Area of Selected Block Industry
1	A	Eastern bye pass
2	B	''
3	C	''
4	D	''
5	E	Western bye pass
6	F	''
7	G	''
8	H	''
9	J	Maikunkele
10	K	''
11	L	''
12	M	Chanchaga
13	N	''
14	P	Minna-Bida Road
15	Q	''

Table 2.2 Selected Buildings in FUT Minna

c	Description	Selected Building
1	PB1	Union Bank plc.
2	PB 2	Works Department
3	PB 3	SAAT(Old)
4	PB4	SAAT(Extension)
5	PB5	SICT(Old)
6	PB6	SICT(Extention)
7	PB7	Senate Building
8	PB8	SEET (Old)
9	PB9	SEET (Extention)
10	PB10	New Female Hostel 1
11	PB11	New Female Hostel 2
12	PB12	1000Capacity Building
13	PB13	SET(Old)
14	PB14	SET (Extention)
15	PB15	PPDU
16	PB16	Caverton Lecture Theater
17	PB17	Entrepreneurship
18	PB18	WASCA
19	PB19	FUT Modern Market

RESULTS AND DUSCUSSION

Rebound Number of Commercial Block Industries

Figure 3.1 shows the rebound number of the selected commercial block industries in Minna. The value of the rebound number ranges from 2 within industry A, B, C,, and L to maximum 10 in industry Q. This number is below the minimum 20 on the rebound hammer (IAEA,2007)

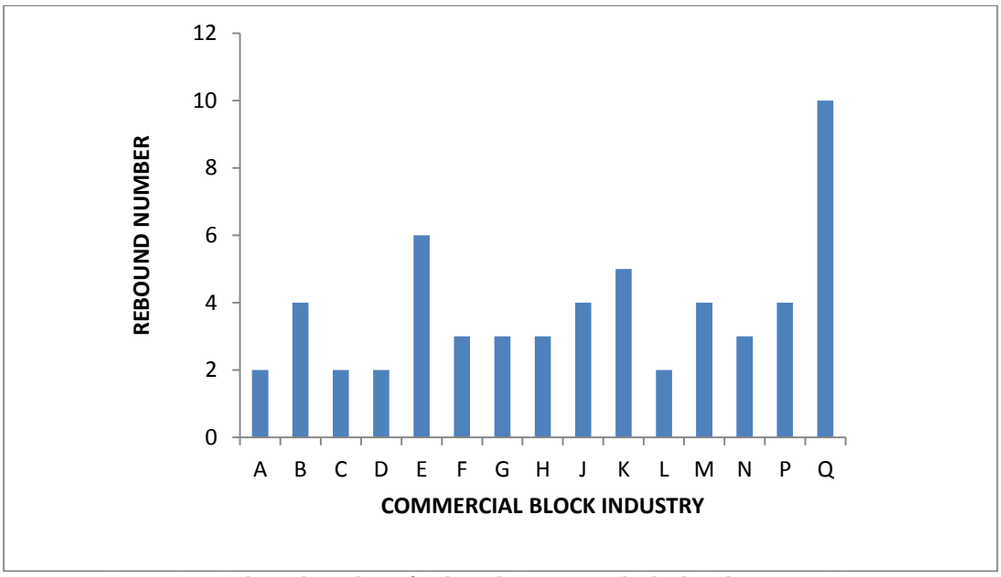

Figure 3.1: Rebound number of Selected Commercial Block Industries in Minna

Compressive Strength of Commercial Block Industries

Figure 3.2 shows the result of destructive test (compressive strength) of selected commercial block in Minna and its environment. From the result none of the block industries meet the minimum compressive strength of 1.5N/mm2 as specified by the code. The maximum compressive strength of 0.77N/mm^2 (Q) and minimum of 0.15N/mm2 (A,Cand D) were recorded is this project .

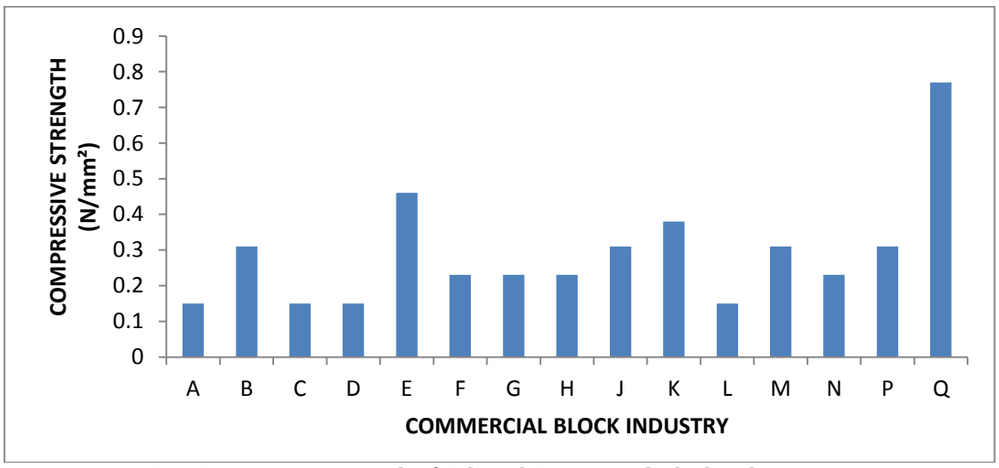

Figure 3.2: Compressive Strength of Selected Commercial Block Industries in Minna

Relationship between the Rebound Number and Compressive Strength of Commercial Block Industries

Figure 3.3 shows comparism relationship between the rebound number and the compressive strength. The highest rebound number of 10 correspond to a compressive strength of 0.77N/mm^2. The lowest rebound number of 2 has a compressive strength of 0.15N/mm^2.

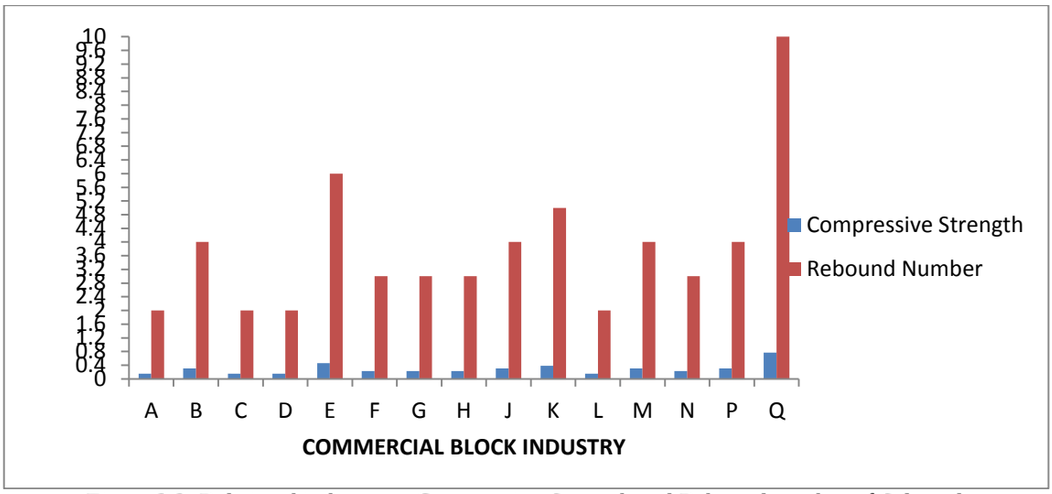

Figure 3.3: Relationship between Compressive Strength and Rebound number of Selected Commercial Block Industries in Minna

Model Relationship between the Rebound Number and Compressive Strength of Commercial Blocks.

Figure 3.4 shows the Model curve relationship between the rebound number and compressive strength of selected commercially produced sandcrete blocks in Minna using MS Excel, (2007). The model allows the determination of compressive strength from the rebound number and has R^2 value of 0.999 signifying a good predictive mode

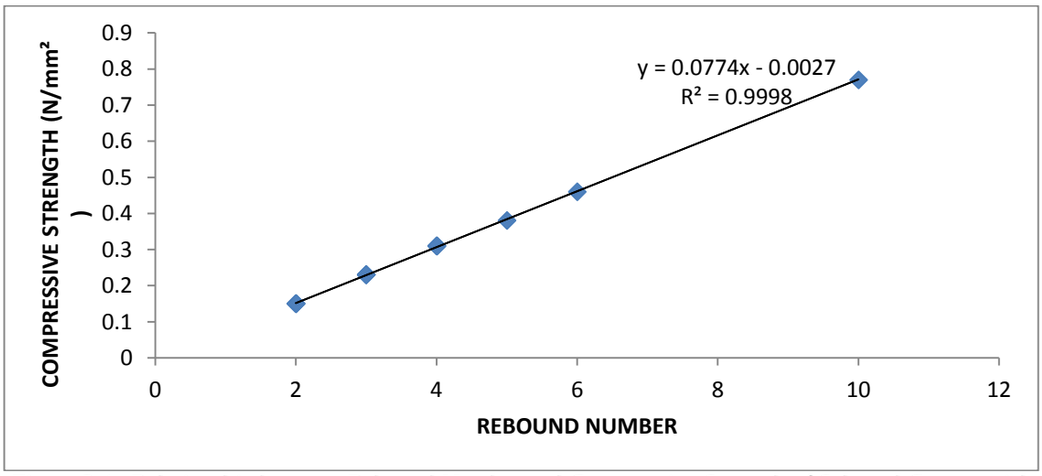

Figure 3.4: Relationship between Rebound Number and Compressive Strength of Selected Commercial Block Industries in Minna

Rebound Number of Selected Buildings in FUT, Gidan Kwanu

Table 3.1 shows the rebound number for all the selected buildings in FUT Gidan Kwanu, Minna. PB1 to PB19 are the result of completed buildings while. PB12 has a value of rebound 21. PB19 has a 7. This shows that wall PB12 is stronger than PB19.

Table 3.1 Rebound number of Selected Buildings

S/N	Description	Rebound number
1	PB1	10
2	PB 2	9
3	PB 3	19
4	PB4	15
5	PB5	16
6	PB6	14
7	PB7	9
8	PB8	20
9	PB9	17
10	PB10	14
11	PB11	12
12	PB12	21
13	PB13	15
14	PB14	11
15	PB15	9
16	PB16	17
17	PB17	10
18	PB18	8
19	PB19	7

Result of Rebound Number of all selected Completed Buildings

The bar chart in Figure 3.5 shows the rebound number of all the selected complete buildings. PB12 has the highest rebound number of twenty-one (21) while PB19 has seven. (7). Others with rebound number of 8,9, 11,15,17 and 19

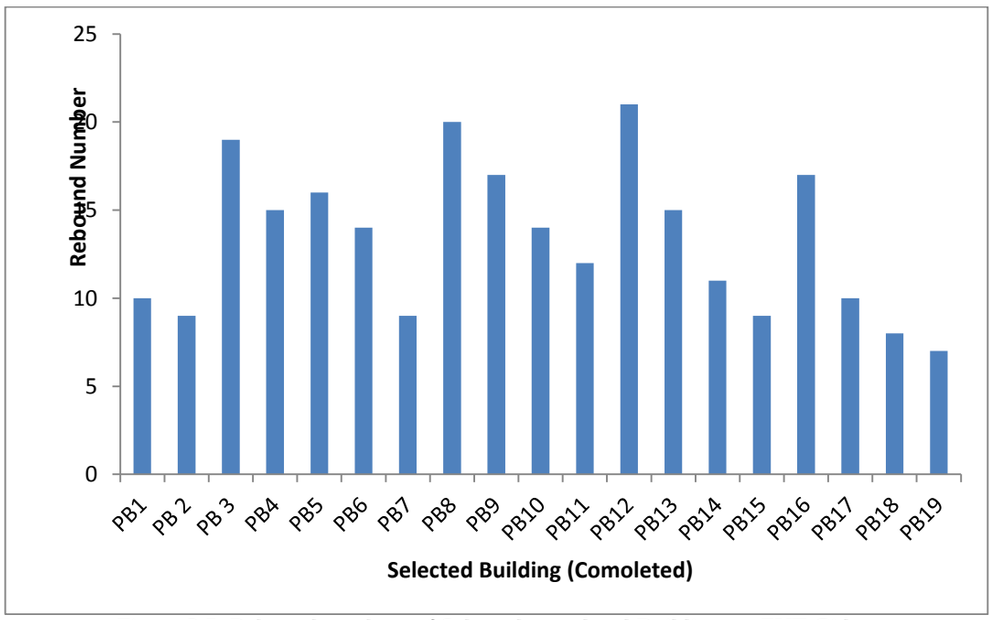

Figure 3.5: Rebound numbers of Selected completed Buildings at FUT Gidan Kwanu, Minna

Predicted value of Compressive Strength from Rebound Number selected Completed

Table 3.2 shows the predicted values of compressive strength from the rebound number. The prediction is obtain from the equation relating the rebound number and the compressive strength.

Table 3.2: Predicted value of Compressive Strength of Selected Buildings in FUT GK Minna

Description	Rebound Number	Predicted Compressive Strength
PB1	10	0.77
PB 2	9	0.69
PB 3	19	1.46
PB4	15	1.15
PB5	16	1.23
PB6	14	1.08
PB7	9	0.69
PB8	20	1.54
PB9	17	1.31
PB10	14	1.08
PB11	12	0.92
PB12	21	1.62
PB13	15	1.15
PB14	11	0.85
PB15	9	0.69
PB16	17	1.31
PB17	10	0.77
PB18	8	0.61
PB19	7	0.54

Model Relationship between Rebound Numbers of selected Completed Buildings and its Compressive Strength.

Figure 3.6 shows the model curve using MS Excel (2007) relating the rebound number and compressive strength of completed selected buildings. The R^2 value being close to 1.00 signify the model prediction error will be low.

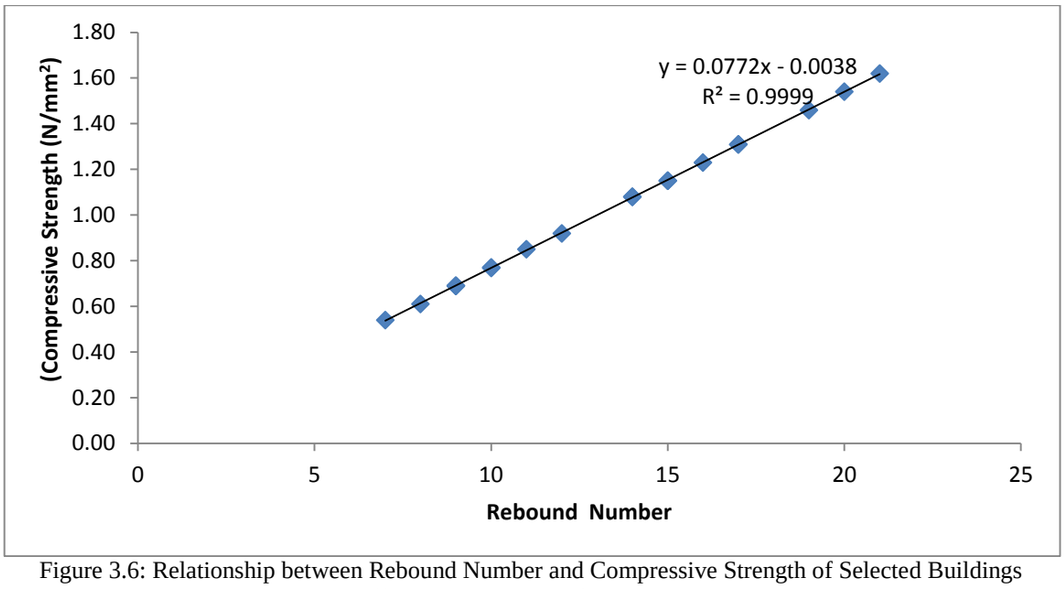

Figure 3.6: Relationship between Rebound Number and Compressive Strength of Selected Buildings (Completed) at FUT GK Minna

Model Equations

Serial no 1 in table 3.3 shows generated model equations from the relationship between the rebound number and compressive strength of commercial hollow sandcrete block. Serial no 2 shows the relationship between rebound number and compressive strength of completed buildings in FUT Minna. The R2 is very close to signifying the models can be used by other researchers to predict the compressive strength of hollow sandcrete block

Table 3.3: Model equation

S/N	Description(y)	Equation	Value of x	R^2 value
1	Compressive strength of Commercial Blocks	$y = 0.077x - 0.002$	Rebound Number	0.99
4	Compressive strength of completed building block	$y = 0.077x - 0.003$	Rebound number of completed building	0.99

CONCLUSIONAND RECOMMENDATIONS

Conclusion

The maximum compressive strength of the selected commercial sandcrete block considered is 0.77N/mm2 and the maximum rebound recorded is 10. This is far below the minimum required strength of 1.5N/mm^2 recommended for the 450 x225 x225mm block and minimum rebound number of 20. From the relationship between the compressive strength and the rebound number, compressive strength increases as the number increases.

The rebound number of the selected buildings in FUT, Gidam Kwanu is between 7-21 for completed buildings This is averagely below the minimum of 20. The predicted value of compressive strength is between 0.54 to 1.62N/mm^2.

The relationship between the rebound number and compressive strength of commercial block industries selected is given by the statistical linear model equation Y=0.077x – 0.002. The model statistical equation of Y= 0.077x -0.003 is obtained from the relationship of rebound number of completed buildings

Recommendation

Based on the investigations carried out, the graphs and models developed in this work is recommended for predicting the compressive strength of sandcrete block walls using rebound number. The authorities of Standard Organization of Nigeria (SON) and relevant professional bodies (Nigeria Society of Engineers (NSE) and Council for the Regulation of Engineering in Nigeria (COREN)) should set up a strong Monitory steam to control the standard of sandcrete block production particularly in Minna and Nigeria in general

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